

PROJECT ABSTRACT

Virtual Heritage Monument Tour in VR

A WebXR virtual tour of heritage monuments: a Raspberry Pi 360-degree capture rig photographs the monument as panoramas, and a tour web app presents explorable scenes with hotspots, narration, a timeline and a quiz.

Project type: Hybrid (hardware + software)

Availability: Built to order

Price: Request a quotation

Suitable branches: Cybersecurity/Blockchain/AR-VR

Technologies: Raspberry Pi 360 capture rig, panorama stitching pipeline, WebXR / three.js tour app

01 Title

Virtual Heritage Monument Tour in VR

02 Introduction / Background

Heritage monuments are fragile, distant and often inaccessible: travel costs, crowds and conservation closures keep most students from studying them on site, while photographs flatten them and video locks the viewer to the cameraperson's path. A 360-degree virtual tour restores the visitor's freedom to look anywhere, but commercial capture services are expensive and closed. The student-scale alternative has two halves: a Raspberry Pi capture rig that photographs a monument as overlapping panoramas at planned stations, and a WebXR tour app that turns those panoramas into explorable scenes with clickable hotspots, narration, a historical timeline and a quiz. The whole pipeline — capture, stitch, tour — is built and documented by the student, which makes the report a genuine content-production case study rather than a software-only exercise.

03 Problem Statement

Students cannot visit most heritage sites, and existing photos and videos do not convey spatial presence or support self-directed exploration. There is a need for an affordable, open pipeline that captures a monument in 360 degrees and publishes it as an interactive VR tour viewable without expensive headsets.

04 Objectives

- Build a Raspberry Pi 360-degree capture rig with a scripted, station-based shooting workflow.

- Document an open-source panorama stitching pipeline producing equirectangular scenes.
- Develop a WebXR tour viewer: drag look-around on desktop, head-tracked view on phone viewers and headsets.
- Author hotspots, per-scene narration with transcript, a historical timeline and a quiz per monument.
- Ship a tour-builder guide so the workflow is reusable for any monument.

05 Proposed System / Working

The buyer plans capture stations around the monument and mounts the Pi rig on the tripod at each; the capture script shoots overlapping, exposure-locked frames per station. Frames move to a PC and are stitched into equirectangular panoramas with the documented open-source pipeline, with troubleshooting for alignment failures and re-shoots. Panoramas drop into the tour app's scenes folder; the buyer authors hotspots (yaw/pitch position, title, text, image), narration scripts and quiz questions in simple data files. The WebXR viewer renders each panorama as an inside-out sphere; hotspots open info cards on click or gaze, the timeline narrates the monument's phases, and the quiz scores the visitor. The finished tour is a static web app — hostable anywhere, with no server code — viewable on desktop, on a phone in a Cardboard-style viewer, or on a WebXR headset.

06 Technologies / Components Used

Raspberry Pi with camera module(s) or 360 camera, tripod mount and battery power; Python capture script with station logging; open-source panorama stitching pipeline (documented step by step); WebXR / three.js-based 360-degree tour web app; editable hotspot, narration and quiz content files; static hosting with no server required.

07 Key Features

- 360-degree capture rig with scripted bracketed shooting at planned stations.
- Documented stitching workflow from frames to equirectangular panoramas.
- WebXR viewer with desktop, phone-viewer and headset paths.
- Clickable hotspots pinned to architectural features with info cards.
- Per-scene narration with text transcript.
- Historical timeline linked to scenes.
- Per-tour quiz with scoring, authored from the same content files.
- Reusable tour-builder guide for any monument.

08 Applications / Use Cases

- Virtual field trips for schools and colleges.
- Heritage documentation and digital preservation pilots.
- Tourism promotion for lesser-known monuments.

- Museum kiosk exhibits and library installations.
- Academic demonstration of panoramic imaging and WebXR.

09 Results & Scope

Design target: a complete published tour (two demo monuments included) with stitched panoramas, working hotspots, narration, timeline and quiz, verified by the documented build checklist (panorama loads, every hotspot opens, quiz scores). Panorama quality depends on the camera used and the buyer's capture discipline — stitching is semi-automatic and re-shoots are a normal part of learning. The buyer must secure photo permissions at protected monuments. Narration and quiz content are authored by the buyer from their own research; the project ships the pipeline and sample content, not a finished encyclopedia.

10 Conclusion

The project turns heritage access into a buildable pipeline: capture hardware, imaging workflow and VR presentation in one student-owned system, producing a tour the buyer can genuinely claim to have made.

11 References

- WebXR Device API specification (W3C).
- three.js documentation — panoramic / 360 viewers.
- Equirectangular projection for spherical panoramas (standard computer-graphics texts).