Programming Challenge :

Accessible Hospital Triage System App

Akshit Bhalla and Shaurya Raghuvanshi

Contents

Background

Hospitals rely on triage systems to manage patient flow and prioritize care. However, many current systems are not fully accessible for patients with disabilities. For example, patients with visual or hearing impairments, mobility challenges, or communication barriers may find it difficult to check in, communicate their needs, or navigate hospital spaces.

This challenge is about re-imagining how accessibility can be embedded directly into hospital triage and patient intake systems.

Challenge

Design a centralized application prototype that helps patients with disabilities interact with a hospital's triage system.

Your application should simulate how patients check in, share their medical needs, and receive updates, while also supporting staff in understanding accessibility requirements.

The core challenge is to design an app that is inclusive and allows you to decide which accessibility features to implement. Each team must:
- Implement the centralized triage/check-in flow (patients → intake → staff).
- Add at least two accessibility features of their choice.

Examples of accessibility features:
- Voice input / text-to-speech.
- High-contrast or large-text UI modes.
- Speech-to-text for patients with hearing impairments.
- Simple navigation aids (for patients with mobility or vision impairments).
- Language translation support.

Each team may consist of **a maximum of four competitors** and is encouraged to demonstrate creativity in enhancing accessibility while maintaining a practical and implementable solution.

Constraints

- Programming language: Any.
- Data should be simulated (fake patient records, mock triage data).
- Must clearly identify implemented accessibility features.

Equipment

Participants are expected to use their personal laptops for development; however, arrangements can be made in advance if a team requires access to additional devices. Reliable internet access will be available throughout the competition to support collaborative work and online research. A small starter dataset containing sample patient records and triage notes will also be provided to help teams simulate realistic scenarios during development and testing

Objectives

- Develop a prototype that demonstrates patient intake and triage flow.
- Implement at least two accessibility features that improve usability for patients with disabilities.
- Demonstrate an understanding of software design, accessibility principles, and user-centered thinking.
- Communicate design decisions through documentation and presentation.

Deliverables

All teams must submit their deliverables electronically **before the end of the design period**. Late submissions will incur penalties consistent with AEC rulebook standards. Deliverables must adhere to the following specifications:

Submission Components

- **Code and Output:** A working prototype or simulation demonstrating the core functionality of the triage and accessibility features.
- **Sample Output Evidence:** Screenshots or a brief output summary included in the submission package.
- **Design Document:** A concise 1–2 page report outlining implemented accessibility features, workflow diagrams, system overview, limitations, and improvement ideas.
- **Presentation Slides:** A maximum 5-minute presentation summarizing the prototype, accessibility features, and how the design improves patient experience.

Formatting Requirements

- Reports must be formatted in **Times New Roman, 12-pt font, 1″ margins, 1.15 line spacing**.
- Include clear headings, figures, and citations in **APA 7 format** where applicable.
- All documents must be submitted in **PDF format** unless otherwise specified.

Submission Process and Timing

- Deliverables are to be submitted **electronically via the platform or email specified by the Competition Director** no later than the design-phase deadline.
- Teams must ensure files are named with their **Team Name and Category** (e.g., "TeamAlpha_Programming.pdf").
- Late submissions or formatting violations may result in penalties or disqualification as outlined in the AEC Rulebook.

Demonstration

- Each team will give a **20-minute presentation &live demonstration** followed by a **10 min Q&A session** with the judges.
- All team members must be present during the presentation phase.

Evaluation

The Programming Challenge will follow the AEC competition framework to ensure fairness, timing consistency, and proper assessment of design, functionality, and communication.

Design Timeline

Competition Timeline

- **Design Phase:** Teams will have **7 hours** to design, implement, and document their prototype, as per the AEC rulebook. All submissions must be uploaded electronically before the end of this period.
- **Rest Period:** A minimum of **one (1) hour** will be provided between the design phase and the start of presentations.
- **Presentation Phase:** Each team will have a maximum of **20 minutes** to present their prototype to the judging panel, followed by a **10-minute Q&A session**.
- **Timekeeping:** Timing will follow AEC standards — time will be paused during judge questions, and penalties may apply for exceeding limits.

Accessibility Features (25 points total)

- Add technical justification for how each feature improves accessibility (e.g., "voice input enhances usability for visually impaired users by reducing reliance on visual UI elements").
- Show evidence of creativity: includes at least one feature that goes beyond basic examples, such as multilingual voice assistants or gesture-based interaction.
- Demonstrate quality: accessibility features must be fully functional and verifiable during the demo, not only conceptual mock-ups.

Core Functionality (20 points total)

- Present a logical workflow diagram showing how patient data flows from check-in to staff handling.

- Ensure the triage flow performs reliably, even with errors or incomplete data.
- Describe how the system handles real-world edge cases such as concurrent users or network interruptions.

User Experience (10 points total)

- Provide a usability test summary, even brief informal testing feedback, showing user-centered design consideration.
- Document UI design choices, including contrast ratios, button layouts, or typography for accessibility clarity.

Coding and AI Usage

- Use of AI tools (e.g., ChatGPT, Copilot, or equivalent) is permitted to assist in coding, debugging, or documentation.
- Teams must clearly cite any externally generated or recycled code (including AI-produced snippets or open-source components) within code comments or documentation, stating the source and describing its function.
- Plagiarism is strictly prohibited. All submissions must represent the team's original design and problem-solving approach.
- During judging, teams may be asked to explain any part of their submitted code to verify understanding and authorship. Failure to do so may result in point deductions or disqualification as outlined in AEC Section 1.10 (Plagiarism Policy).

Demonstration & Communication (15 points total)

- Deliver a story-driven demo showing a short patient scenario where accessibility features make a measurable difference.
- Back up explanations with visuals — one slide per accessibility feature showing "problem → solution."
- Prepare for Q&A topics such as data handling, privacy, security, and future enhancements.

Documentation (15 points total)

- Include a visual workflow diagram (activity, sequence, or flowchart format).
- Summarize design decisions and features in concise bullet points, avoiding unnecessary paragraphs.
- Provide a limitations section that logically transitions into proposed future improvements.

Bonus (Up to +10 points)

- Awarded for innovative add-ons beyond core requirements, such as predictive triage prioritization, sentiment analysis, or advanced assistive-tech integrations.

Rubric

Category	Criteria	Weight
Accessibility Features	- Creativity - Implementation - Quality	/5 /10 /10
Core Functionality	• Working Triage Flow • Reliability	/10 /10
User Experience (UX)	1. Ease of Use 2. Clarity	/5 /5
Code Quality	1. Structure 2. Readability 3. Efficiency	/5 /5 /5
Demonstration & Communication	1. Presentation 2. Justification 3. Q&A	/5 /5 /5
Documentation	1. System Workflow 2. Explanation of Features 3. Limitations	/5 /5 /5
Bonus	Extra innovative features or outstanding user centered design.	+10
Total		/100

Penalty Matrix

Infraction	Description	Penalty
Plagiarism / Uncredited AI or External Code	Any unacknowledged or copied code, failure to cite AI-generated or open-source content, or inability to explain submitted work.	*Immediate review by judges; up to –25 points or disqualification (as per AEC § 1.10).*
Late Submission of Deliverables	Deliverables submitted after the official design-phase deadline.	–5 points per hour late (up to maximum –20).
Missing Team Member at Presentation	Any registered member absent from the scheduled presentation without prior approval.	–25 points per missing member.
Premature Room Entry or External Communication	Entering competition rooms before allowed time, accessing restricted materials, or communicating with other teams during the design period.	–10 points first offense; disqualification for repeat offense.
Formatting Non-Compliance	Failure to meet required report or presentation formatting standards (font, margins, spacing, file naming).	–5 points.
Code Not Executable / Demo Failure	Inability to demonstrate a functioning prototype without valid justification.	–10 points.
Conduct Violation	Unprofessional behavior, disrespect toward judges, staff, or competitors.	–15 points and/or removal from competition.

Notes:

- The Competition Director and Judging Panel retain discretion to adjust penalties based on severity and intent.
- Teams will be notified of any deductions and may submit an appeal per AEC Rulebook Section 1.8 (*Violation of Competition Rules*).

References

Apple Inc. (n.d.). *Accessibility*. Human Interface Guidelines. https://developer.apple.com/design/human-interface-guidelines/accessibility

Canadian Association of Emergency Physicians. (n.d.). *Canadian Triage and Acuity Scale (CTAS)*. https://ctas-phctas.ca/

Google. (n.d.). *Accessibility*. Material Design 3. https://m3.material.io/foundations/accessible-design/overview

World Wide Web Consortium. (2023, October 5). *Web Content Accessibility Guidelines (WCAG) 2.2*. https://www.w3.org/TR/WCAG22/

World Wide Web Consortium. (n.d.). *WAI-ARIA overview*. Web Accessibility Initiative. https://www.w3.org/WAI/standards-guidelines/aria/

Zhang, A. (n.d.). *SpeechRecognition 3.10.0*. PyPI. https://pypi.org/project/SpeechRecognition/