



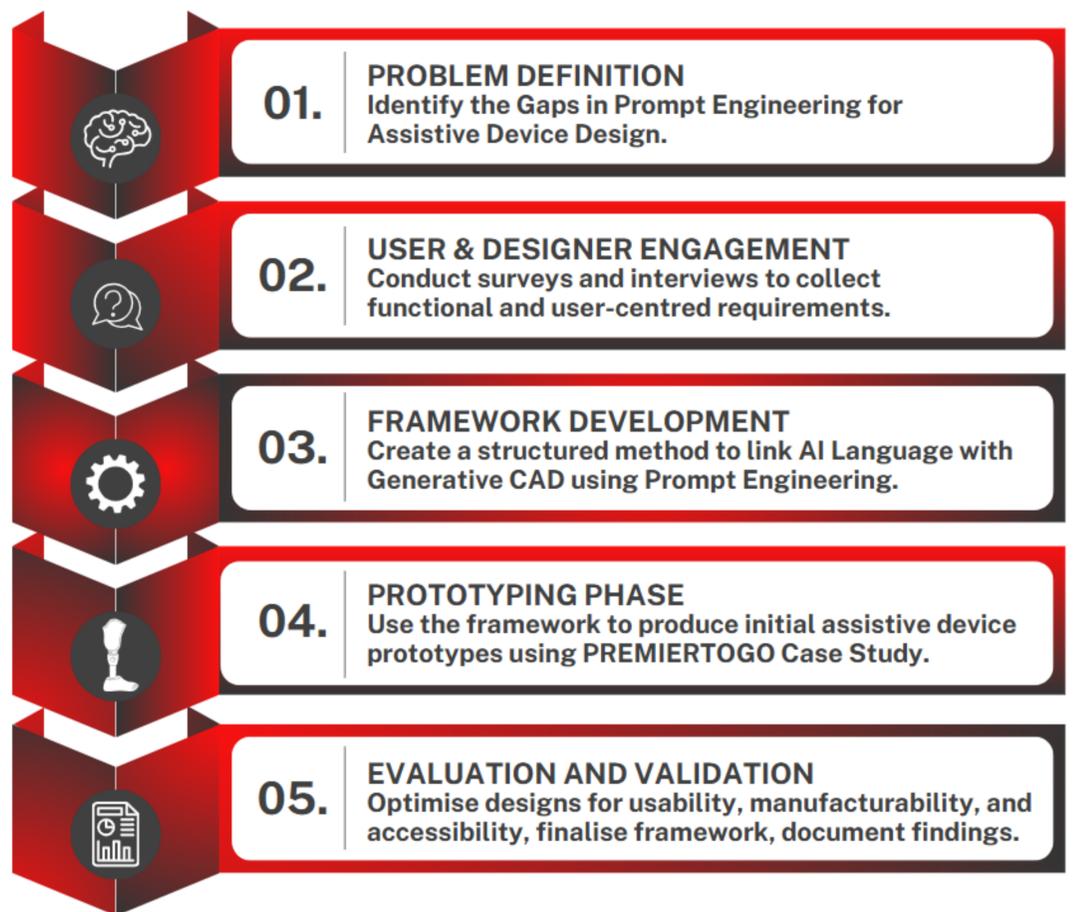
Towards a Prompt Engineering Framework for Generative AI in Assistive Device Design

Project brief

This study explores how prompt engineering can optimise artificial intelligence workflows in the design of assistive technologies. It proposes a framework for translating user-centred requirements into manufacturable outputs within digital design environments. The PREMIERTOGO project, an AI-enhanced modular prosthesis integrating generative design, 3D printing, and sensor based human machine interaction, serves as a practical case study. By applying prompt engineering methods to this real world context, the research aims to demonstrate how intelligent, adaptive workflows can improve accessibility, functionality, and user experience in assistive device development, contributing to the advancement of next generation, human-centred engineering solutions.

Methodology

This study adopts a structured, iterative design research approach to develop a prompt engineering framework that supports engineering designers working on assistive technologies. It begins with a critical review of Design-for-X principles, generative design methods, and natural language prompt strategies. Insights gathered through interviews with prosthetists, and specialists will inform the translation of user-centred requirements into structured prompts for both design synthesis and analysis within CAD environments. The PREMIERTOGO modular prosthesis serves as an applied case study, offering real-world design challenges such as component modularity, aesthetics, and the integration of embedded sensors, crucial for gait analysis, real-time feedback, and health monitoring. This study is crucial in aiding engineering designers by leveraging prompt engineering within generative design frameworks, it aims to support the integration of functional elements such as embedded sensors without compromising structural integrity, usability, or manufacturability.



Results & Conclusions

While the study is still in its early stages, the intended outcome is a refined and enhanced version of the PREMIERTOGO prosthetic, informed by the application of a prompt engineering framework. By investigating how structured natural language prompts can guide engineering designers in navigating design constraints, the study aims to support improvements in usability, manufacturability, and adaptability. The resulting framework will enable more efficient exploration of generative design possibilities, ultimately contributing to the development of a smarter, more personalised prosthetic solution that builds upon the foundations laid by PREMIERTOGO.