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Design and Implementation of a Simple Compiler in Python for Generating Personalized Avatars

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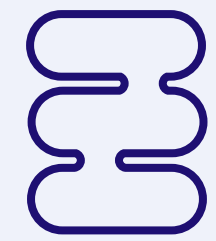
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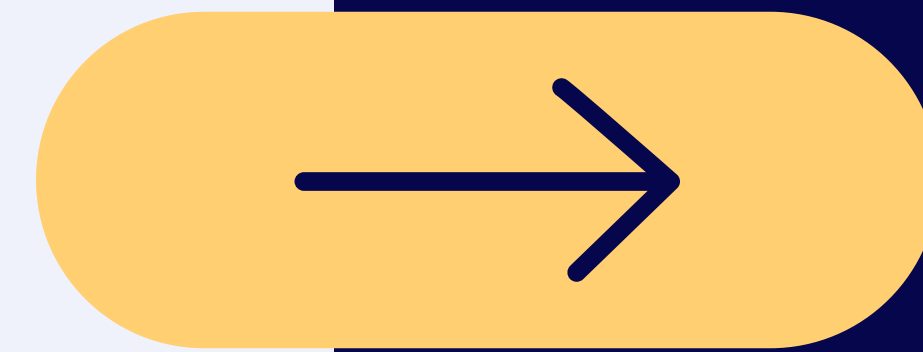


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Introduction

While compilers are crucial in computer science, they are often taught through abstract theory and complex syntax. Our goal was to create a visual and interactive tool that helps students grasp compiler phases more intuitively by turning code into visible outcomes like avatars.



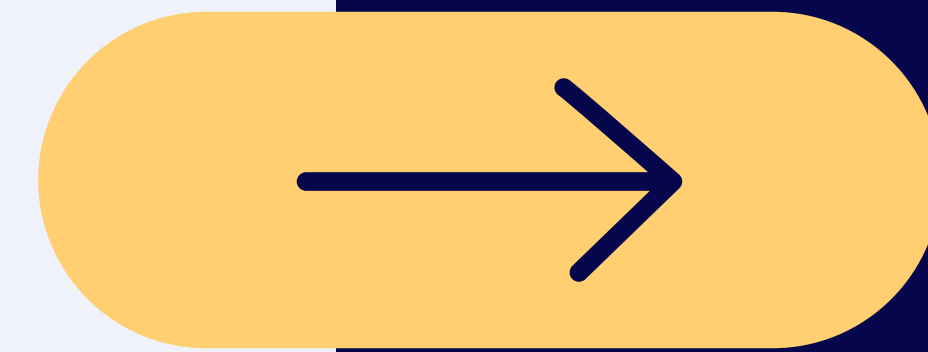
Problem Statement

Most avatar libraries require direct programming knowledge, and educational compiler tools typically lack engaging, visual feedback. We found there was no accessible way to combine these two areas in an educational context, which inspired our project.

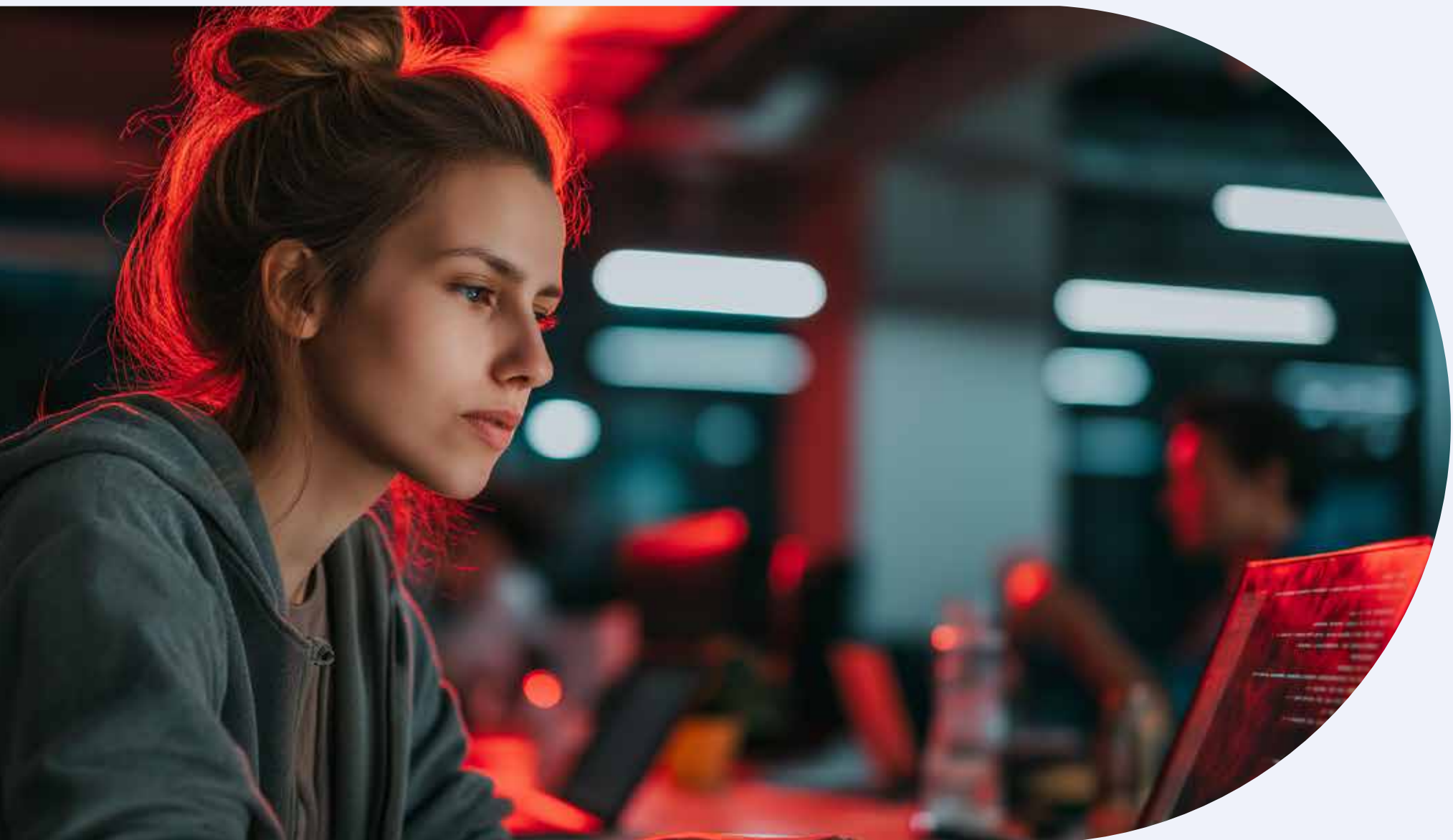


Objectives

We aimed to create an educational compiler that translates user-friendly commands into personalized avatars. To do this, we defined a domain-specific language and built the full compiler structure—including lexical, syntactic, and semantic analysis—combined with an interactive interface

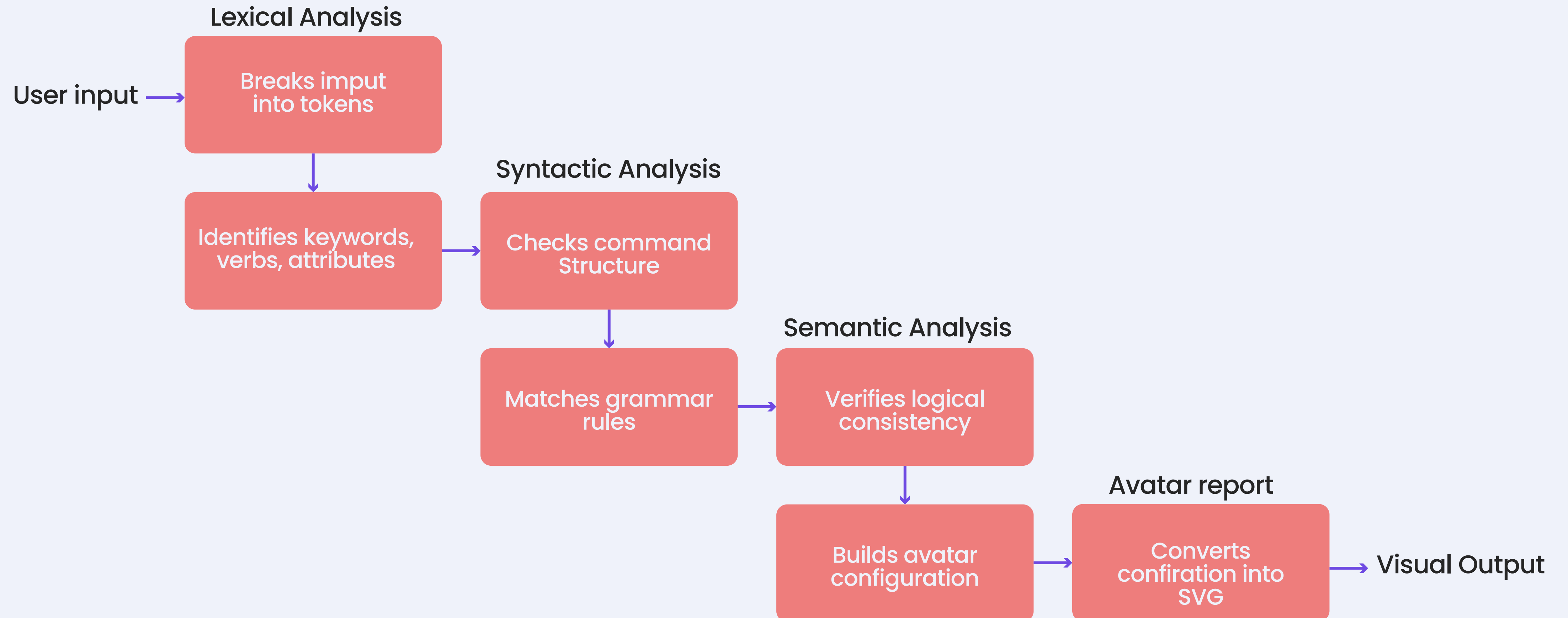


Solution Overview



The solution consists of a simplified compiler implemented in Python. The user inputs commands into a GUI, and these are validated through compiler phases before being transformed into a digital avatar using the `py-avataaars` library. This process makes learning compiler steps more engaging.

System Architecture



Example:

Valid Input

Input:
inicio
teñir cabello castaño _oscuro;
ajustar ropa hoodie;
añadir accesorio gafas _redondas;
expresar boca sonriente;
final

Output: Avatar with hoodie, brown hair, smiling face, glasses.



Error *Handling*

Invalid Input:
inicio
teñir ropa afro;
final

Error: (Semantic error) Invalid value 'afro' for attribute 'ropa'



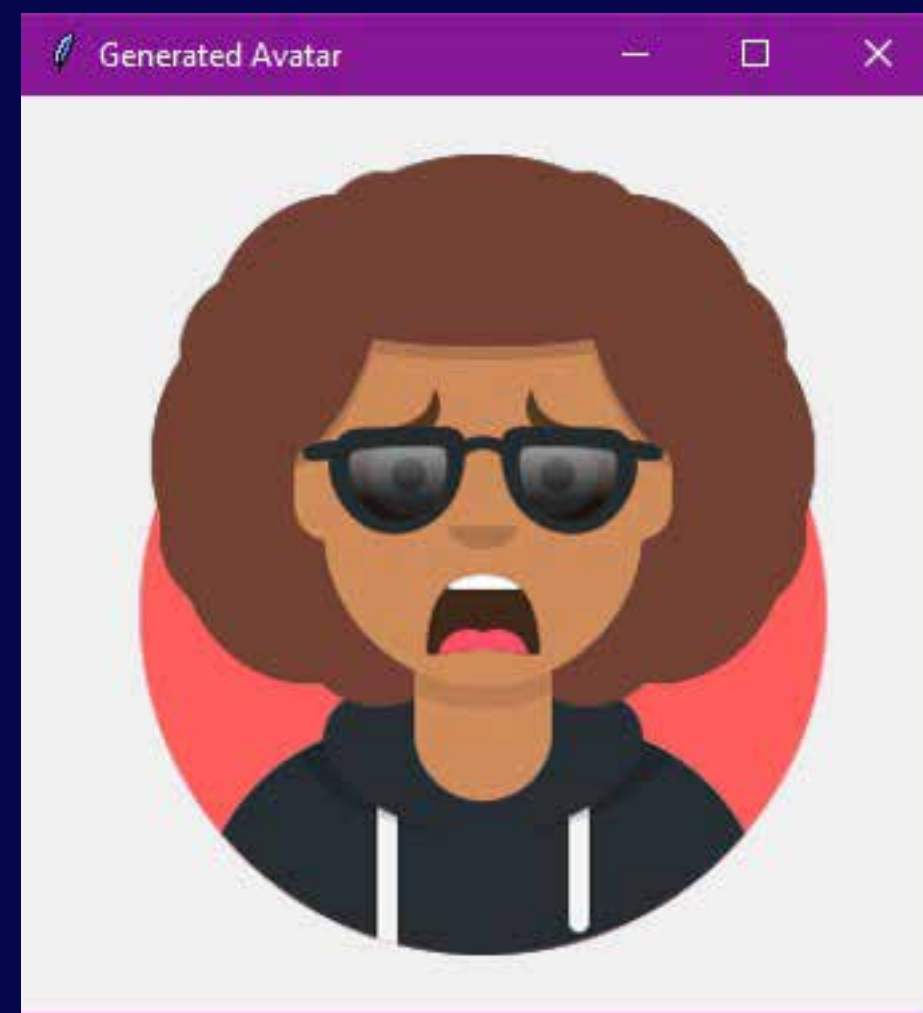


Educational Value

By converting code into visual output, this tool helps beginners understand the purpose and function of each compiler phase. It fosters experimentation and motivates learners by showing the immediate impact of their inputs.

Results

Our tests confirmed that the compiler modules worked as intended with both valid and invalid inputs. The GUI was user-friendly, and avatar generation was consistent. This demonstrated the effectiveness of our educational approach





Conclusion

This project proved that compiler concepts can be taught using a fun and accessible tool. The combination of analysis modules with a visual avatar generator created a complete learning experience. In the future, we plan to add real-time feedback and support for more features.



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THANKS
Any questions?