PIXELDRAW

AUTHORS

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INTRODUCTION

PixelDraw is an ongoing project designed to facilitate the generation of pixel art through a specialized declarative language. At its core, PixelDraw leverages compiler fundamentals to translate high-level graphical commands into low-level pixel manipulations. Drawing inspiration from early programming environments like Logo and Turtle, the project prioritizes a reduced cognitive load for users by abstracting complex drawing primitives into simple, human-readable statements. This design choice aims to democratize pixel art creation while simultaneously serving as an intuitive pedagogical tool for exploring the intricate interplay between language design, parsing, and rendering pipelines within a compiler's architecture.

METODOLOGY

PixelDraw proposes a language with a clear syntax, bThe PixelDraw compiler transforms a declarative art language into a final image through a well-defined pipeline. It begins with Lexical Analysis, where the raw source code is broken down into a stream of meaningful tokens (e.g., keywords, numbers, hex codes) using regular expressions, handled by the LexicalAnalyzer and Token classes. This token stream then proceeds to Syntactic Analysis, performed by the SintacticAnalyzerPixelDraw. Here, the tokens are validated against the language's formal grammar rules, ensuring the code's structure is correct and raising errors for any grammatical violations. Finally, the processed, syntactically correct instructions enter the Semantic Analysis and Pixel Matrix Generation phase, managed by the SemanticAnalyzer. This stage interprets the meaning of each command, managing the canvas size and current drawing color, validating coordinates to prevent out-of-bounds drawing, and translating high-level commands like RECTANGLE or POINT into individual pixel data. It also handles control flow elements like repeat by re-processing token blocks. The ultimate output is a complete pixel matrix, ready for rendering into a visual image.

EXPECTED RESULTS

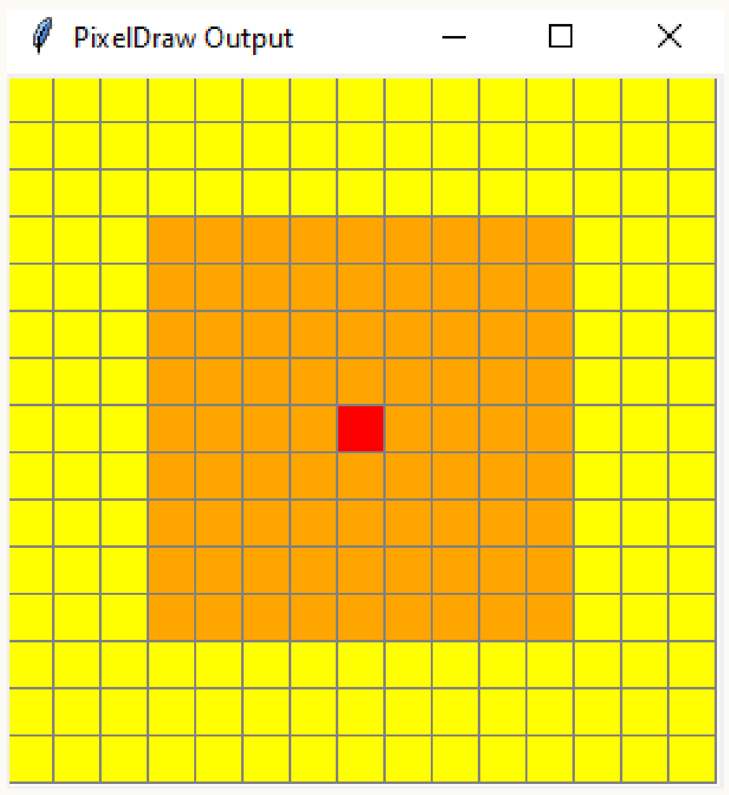
- Pixel grid image automatically generated from the source code.
- Educational tool for teaching logic and visualization.
- Simple interface for students or creatives with no prior programming experience.

OBJECTIVE

PixelDraw is a project focused on designing a declarative language for describing images on a pixel grid and a compiler to interpret these instructions, generating a final image. This approach simplifies pixel art creation by allowing users to specify what to draw, rather than how, using intuitive primitives like PIXEL, LINE, and RECTANGLE. The compiler then translates these high-level declarations into precise modifications of a pixel buffer, which is outputted as a standard image file. This design lowers the barrier to entry for aspiring pixel artists and offers a practical introduction to fundamental compiler principles.

EXAMPLE

- size 15x15
- color #FFFF00
- rectangle 0 0 15 15
- color #FFA500
- rectangle 3 3 9 9
- color #FF0000
- point 7 7
- """



CONCLUSIONS

PixelDraw possesses significant potential as both an educational and creative resource, leveraging its declarative language to lower the barrier to digital art while simultaneously offering a practical, engaging pathway to understanding core compiler design principles. Despite being in its initial development phase, the meticulous technical planning and thoughtful language design have laid a remarkably solid foundation, providing a clear and robust roadmap for the future implementation of its full compiler pipeline and the expansion of its artistic capabilities.

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