

Vibe: An AI-Assisted System for Automated Website Development Through Natural Language Conversation

Rohan Pandey
Computer Engineering
Rizvi College of Engineering
Mumbai, India

Arafat Shaikh
Computer Engineering
Rizvi College of Engineering
Mumbai, India

Ahmed Shaikh
Computer Engineering
Rizvi College of Engineering
Mumbai, India

Abstract—This paper presents *Vibe*, an AI-assisted web development system designed to automate the process of creating fully functional web applications through natural language conversation. Traditional web development requires extensive expertise in HTML, CSS, JavaScript, and modern frameworks, making it inaccessible to non-technical users. Existing no-code and low-code platforms, while simplifying the process, impose rigid templates and limited customization, failing to deliver production-quality, framework-native output. The proposed system integrates a multi-agent AI architecture, sandboxed code execution, and real-time preview capabilities to enable end-to-end website generation. It accepts natural language prompts via a conversational interface, processes them through specialized AI agents built on the Inngest Agent Kit with OpenAI's GPT-4.1, and generates complete Next.js applications within isolated E2B cloud sandboxes. Experimental evaluation demonstrates that the system successfully generates complex, multi-component web applications with realistic interactivity and production-quality code structure, reducing development time from hours to minutes.

Keywords— *AI Website Developer, Natural Language Processing, Code Generation, Multi-Agent Systems, Next.js, Large Language Models, Sandboxed Execution*

I. PROBLEM STATEMENT

Despite advancements in web development tooling, the process of creating modern web applications still faces several challenges:

- Manual web development requires expertise in multiple technologies (HTML, CSS, JavaScript, TypeScript, React, and modern frameworks).
- Existing no-code platforms impose rigid templates that limit creative expression and customization.

- Low-code solutions produce proprietary, non-exportable output that cannot be extended with standard development tools.

- Converting a natural language description into a fully functional application remains a multi-step, error-prone process.

These challenges highlight the need for an automated system that can bridge the gap between user intent expressed in natural language and production-ready web applications.

II. INTRODUCTION

The increasing complexity of modern web development has created a paradox: while the demand for web applications continues to grow, the technical barrier to creating them remains prohibitively high. Building a contemporary web application requires proficiency in multiple languages, frameworks, and toolchains — a skill set that takes years to develop.

Vibe is proposed as an AI-assisted web development system that simplifies and automates the entire process of website creation. Instead of requiring users to write code manually, the system leverages a multi-agent AI architecture to autonomously handle the complete development workflow — from code generation to dependency installation and file management. Users describe their desired website in plain English through an intuitive chat interface, and the system generates complete, deployable Next.js applications.

III. LITERATURE REVIEW

The intersection of artificial intelligence and software engineering has been an active area of research, particularly in the domain of automated code generation.

LLM-Based Code Generation: Large language models fine-tuned on code can solve programming problems with remarkable accuracy. Models like GPT-4 have further advanced the state of the art, achieving near-human performance on standard coding benchmarks.

No-Code and Low-Code Platforms: Platforms such as Wix, Squarespace, and Webflow have democratized basic website creation. However, these platforms generate proprietary markup and restrict customization, making them unsuitable for complex, production-grade applications.

Multi-Agent Systems: The application of multi-agent architectures to software engineering tasks has shown promising results. Systems demonstrate that decomposing complex tasks across specialized agents can improve code quality and task completion rates.

IV. DRAWBACKS IN EXISTING SYSTEM

Existing web development automation tools suffer from several limitations:

1. **Template Rigidity:** No-code platforms constrain users to predefined templates.
2. **Proprietary Lock-in:** Most platforms generate proprietary markup.
3. **Lack of Execution Verification:** Many systems produce code without verifying that it compiles or runs.
4. **No Iterative Refinement:** Most systems treat each generation as an independent task, lacking conversation context.

V. PROPOSED SYSTEM

The proposed system, Vibe, is designed as a full-stack application that automates web application development through natural language conversation. It accepts natural language descriptions as input, processes them through a multi-agent AI pipeline, and generates complete Next.js applications within isolated cloud sandboxes.

A key feature of the system is its multi-agent architecture, which employs three specialized agents: a Code Agent for generating and executing code, a Response Generator for creating user-friendly summaries, and a Title Generator for labeling generated fragments.

VI. SYSTEM ARCHITECTURE & DESIGN

The Vibe system follows a modular and scalable architecture designed to efficiently handle user interaction, AI-based code generation, and sandboxed execution.

A. Frontend Layer

The frontend is implemented as a Next.js 15 application with React 19, providing an intuitive user interface including the chat interface, project management dashboard, and live preview panel.

B. Backend Layer

The backend uses tRPC for end-to-end type-safe API communication. User authentication is handled by Clerk, providing email/password and social login options.

C. AI Agent Layer

The core intelligence resides in the multi-agent system built on the Inngest Agent Kit. Three specialized agents coordinate to produce the final output: Code Agent (GPT-4.1), Response Generator, and Title Generator.

D. Execution Layer

Each generation request runs within an isolated E2B cloud sandbox pre-configured with Next.js 15.3, Shadcn UI components, and Tailwind CSS. The sandbox provides a writable file system and a publicly accessible preview URL.

VII. METHODOLOGY USED

The working of the system follows a structured pipeline:

1. **Input Upload:** User types a website description in the chat interface.
2. **Event Dispatch:** An Inngest event is dispatched with the prompt.
3. **Sandbox Creation:** A new E2B sandbox is provisioned.
4. **Context Loading:** The last 5 messages are loaded for conversation continuity.
5. **AI-Based Generation:** The Code Agent iteratively generates files and executes commands.
6. **Output Display:** The frontend displays the live sandbox URL in an embedded iframe.

VIII. TECHNOLOGY STACK

Framework: Next.js 15.3

Frontend: React 19

Language: TypeScript

Styling: Tailwind CSS 4

UI: Shadcn UI

Auth: Clerk

Database: PostgreSQL
AI Model: OpenAI GPT-4.1
Sandbox: E2B Interpreter

IX. RESULTS AND DISCUSSIONS

The system was tested using multiple website generation prompts of varying complexity. The results demonstrate that Vibe is capable of generating structured, functional, and aesthetically polished web applications.

A. User Interface



Fig. 1. Vibe Integrated Development Environment

B. AI-Generated Application Output

The output includes a responsive hero banner, interactive components, and dark mode support — all generated autonomously by the Code Agent.



Fig. 2. AI-Generated Netflix Application

C. Iterative Development



Fig. 3. Iterative Development Interface

D. Project Management Dashboard



Fig. 4. Project Management Dashboard

X. FUTURE SCOPE

- Integration of multiple LLM providers with automatic fallback mechanisms.
- Support for backend logic generation including API routes and database schemas.
- Implementation of collaborative editing features.
- Expansion to support additional frameworks beyond Next.js.

XI. CONCLUSION

Vibe demonstrates how AI-assisted systems can significantly improve web development workflows by automating the entire process from natural language description to functional web application. The system successfully integrates multi-agent AI architecture, sandboxed code execution, and real-time preview capabilities to produce production-quality Next.js applications.

The multi-agent approach proves effective in decomposing complex generation tasks while maintaining output quality. The system reduces development time from hours or days to minutes, democratizing access to modern web application creation for users regardless of their technical background.

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