

cartokit

Direct Manipulation Programming for Interactive Cartography

Key Insight

For direct manipulation programming systems supporting data work, **program re-evaluation on every user interaction is too expensive.**

cartokit uses paired **code generation** and **reconciliation algorithms**—operating on a shared **intermediate representation**—to synchronize generated programs with outputs.

System Architecture

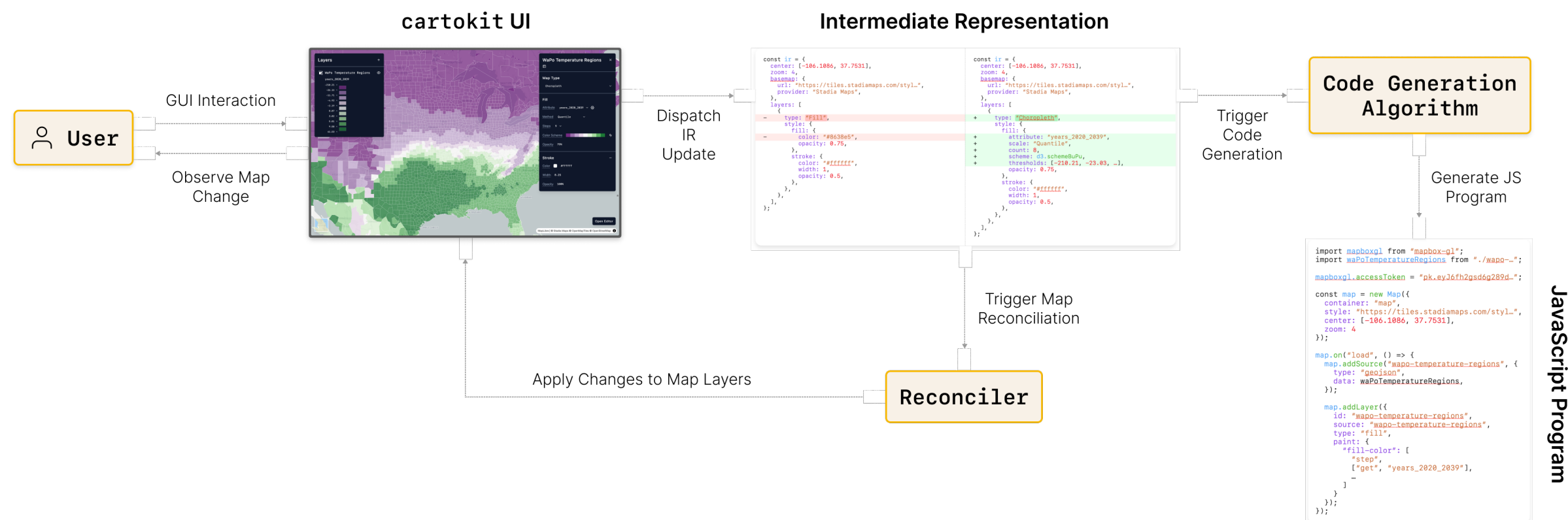


Fig. 1 The cartokit system architecture. User interactions in the **Properties Panel** dispatch updates to the cartokit IR. The **Reconciler** propagates these updates back to the map, while the **Code Generation Algorithm** generates a JavaScript program that, when executed, reproduces the map exactly.

Results

Benchmarks

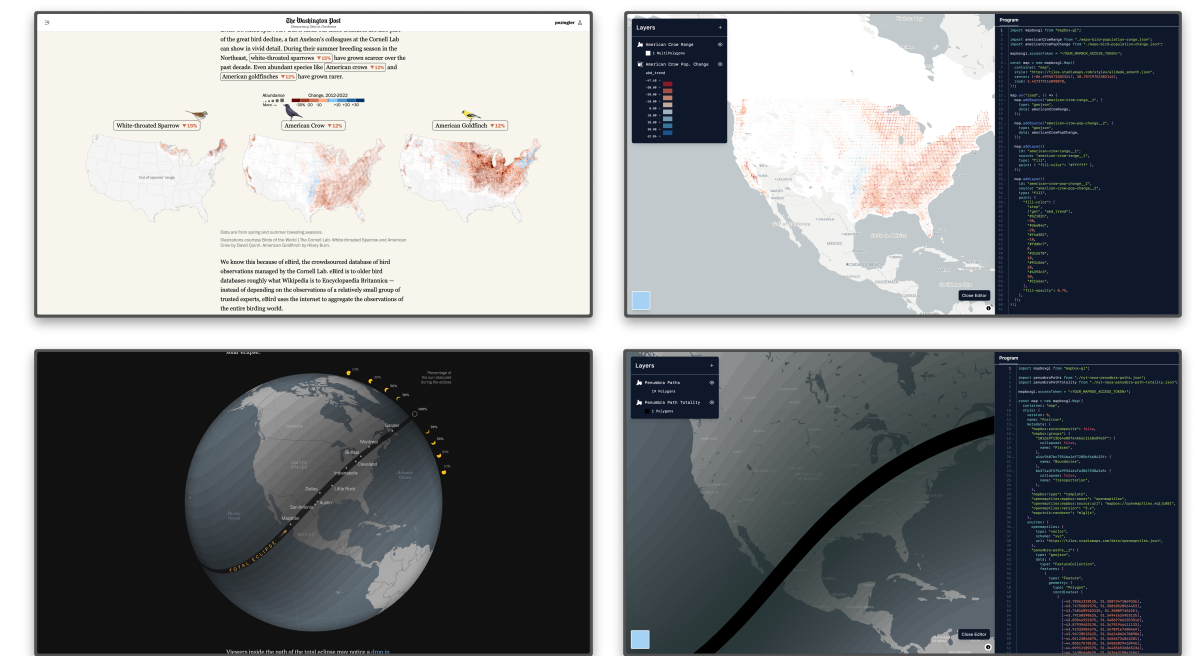


Fig. 2 **Reproducing maps published in national newsrooms with cartokit.** We used cartokit to reproduce nine maps published by national newsrooms *purely* through direct manipulation. The system generated corresponding JavaScript programs that can be copied, modified, and deployed to the web.

Performance

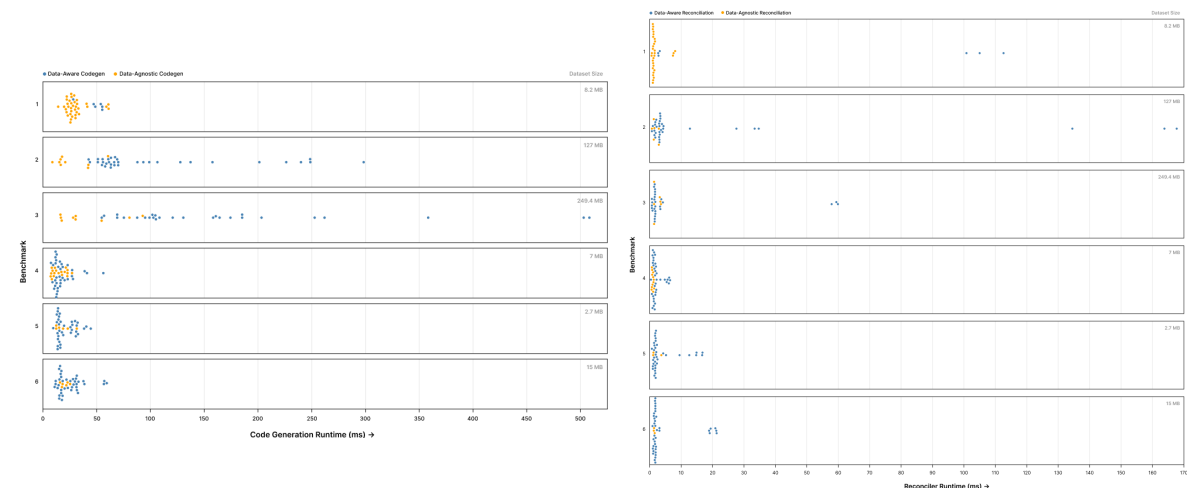


Fig. 3 **Distributions of code generation and reconciliation runtimes on six benchmark maps.** cartokit recorded median runtimes of 28.6ms and 5.73ms for code generation and reconciliation, respectively.