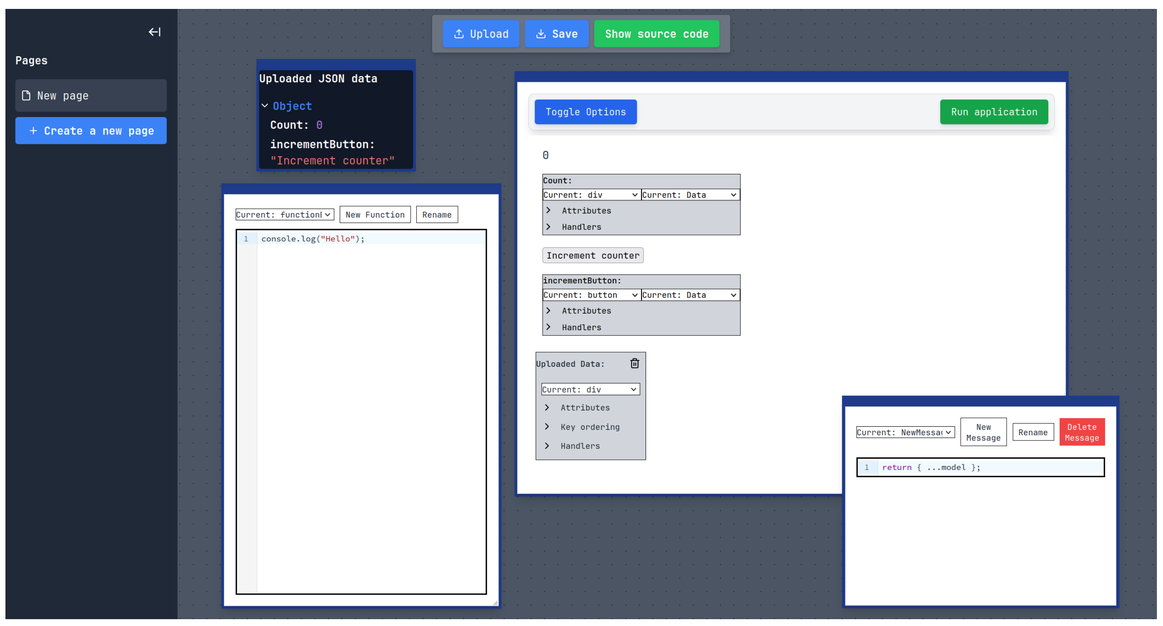
Data-driven low-code programming system

Jaroslav Švarc | Faculty of Mathematics and Physics, Charles University | 2025

Intro

Low-code programming systems provide a graphical user interface (GUI), through which users can create software elements. Software development using low-code programming systems is increasingly popular and traditional low-code development systems that provide user interface creation functionality primarily provide the *UI-to-data* approach, where developers create user interface elements before populating them with data. However, the *data-to-UI* approach, where the development process begins with concrete data that drives the creation of corresponding UI elements, remains unexplored as a primary development method. We present the InterfaceSmith prototype programming system, which implements *data-to-UI* as the primary development method for creating web applications' UI elements.



Motivation

The primary motivation for this research is to allow the creation of single-page web applications following the Elm architecture, also known as Model-View-Update, based on concrete data uploaded to the system. The aim is to allow incremental creation of UI elements based on the uploaded data's type and structure, and their modification using the provided low-code interface.

Goals

1. Explore the
2. Create a working **prototype programming system** implementing the data-driven approach.
3. Benchmark the prototype application on the following tasks:
   - A simple **TO-DO list** application inspired by the *TodoMVC* becnhmark.
   - **Counter** task from the *7GUIs* becnhmark.
   - **Temperature converter** task from the *7GUIs* becnhmark.

Solution approach

Hole-based approach, traversal, example image

Experiments

Task	Total	Prep	Custom	Ref.	Success
TO-DO List	54	14	40	N/A	Yes
Counter	8	4	4	11	Yes
Temp. Converter	34	6	28	66	Yes

Task	Total	Prep (%)	Custom Logic (%)
TO-DO List	54	26%	74%
Counter	8	50%	50%
Temp. Conv.	34	18%	82%

Summary

Supervisor

Mgr. Tomáš Petříček, Ph.D.
Department of Distributed and Dependable Systems

Repository

https://github.com/JerrySvarc/InterfaceSmith

Thesis

https://jerrysvarc.github.io/bachelor-thesis/thesis.pdf