Designing Coast Salish woven basket patterns using Jupyter notebooks

Cedric Chauve, Laura Gutierrez-Funderbunk, Veselin Jungic, Jenifer Pham, Howell Tan

Department of Mathematics, Simon Fraser University

Motivation: geometric patterns of Salish baskets

Goal: a tool to explore basket geometric patterns

We want to design an educational tool that can be used in the classroom and will allow students to explore the design of these patterns through an intuitive and non-technical geometric approach.

Our ultimate aim is that such a tool will benefit to students from different backgrounds, from developing an interest in mathematics motivated by important cultural objects to learning about indigenous culture through the actual design of basket-like geometric patterns.

Infrastructure: Jupyter notebooks

A notebook is a file that contain both code (python here) and formatted text, including hyperlinks, images, videos, … (markdown format).

The notebook can be created locally through a web browser.

The notebook can be visualized (formatted text and results from running the code) locally or through an online viewer (*e.g.* binder).
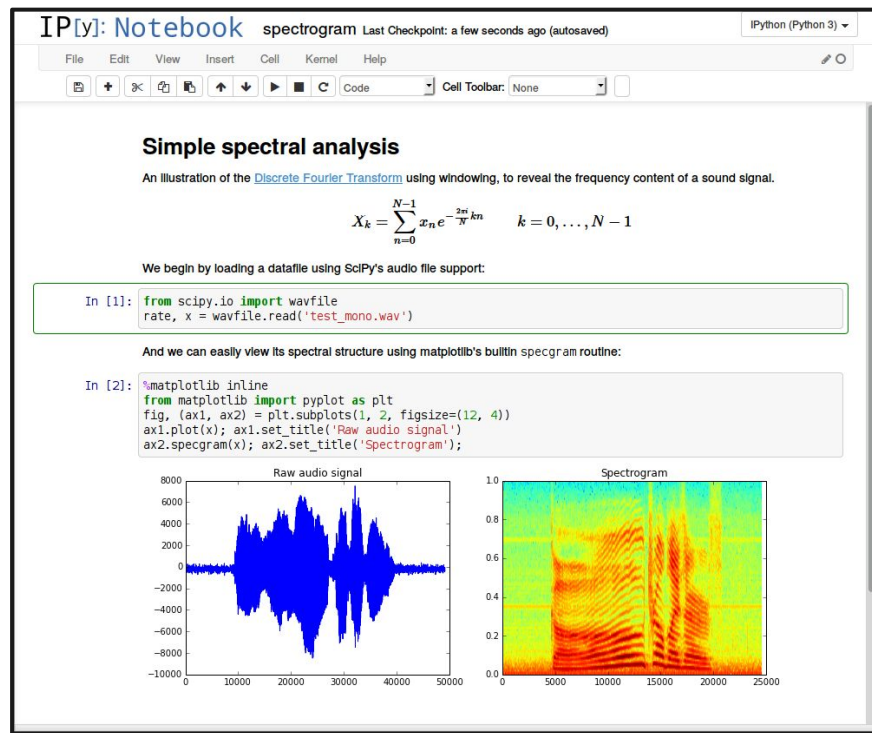
Infrastructure: The Callysto project

The goal of [Callysto](#) is to bring Jupyter notebooks in the classroom, to encourage computational and design thinking among grades 5-12 students.

The project, lead by PIMS and Cybera, includes
➢ the development of notebooks related to the grades 5-12 curriculum (currently AB and BC),
➢ The develoment and maintenance of an online hub for Jupyter notebooks, [hub.callysto.ca](#).

The Callysto project funded a team of three developers/creators this summer at SFU to work, among others on the notebooks described today.

The algorithm: principle

A geometric pattern is built from a (simple) starting shape (broken line, triangle, …) onto which we apply iteratively a sequence of geometric operators (reflection, stacking, flip).

Patterns can be edited and combined into more complex ones.
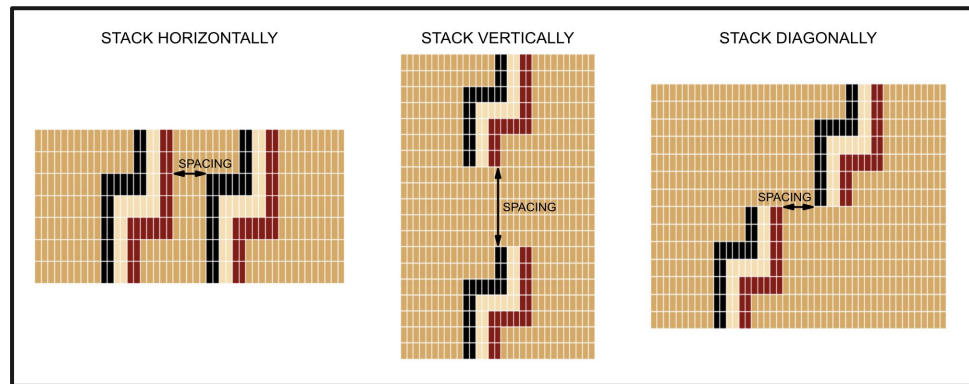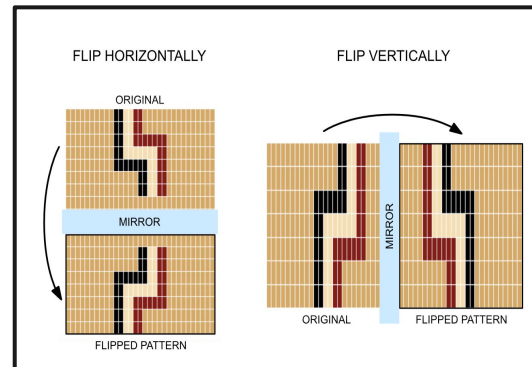
The algorithm: example
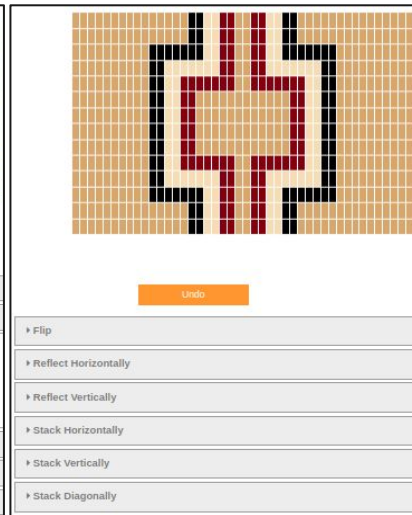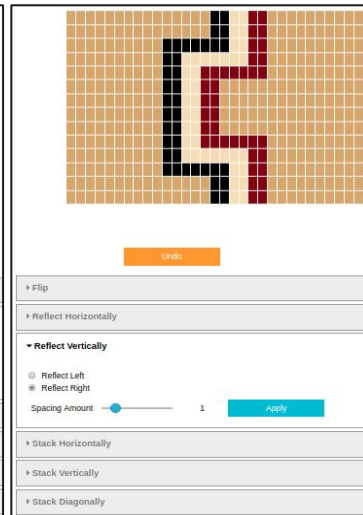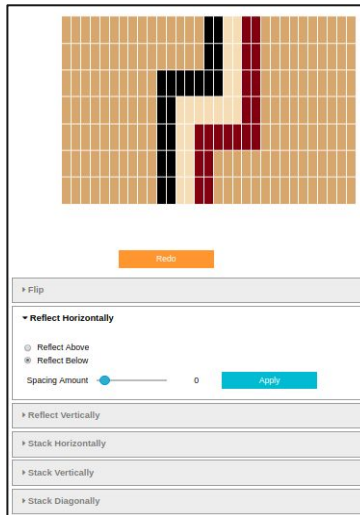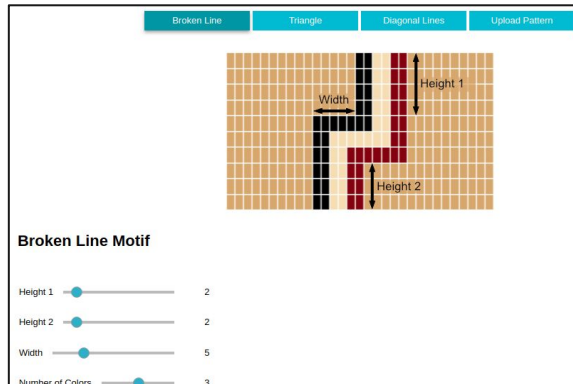
Remark. This approach is based on an algorithmic view of pattern design: a pattern can be fully described by its starting shape and sequence of applied operators. This is very different of the actual basket crafting process.

The interface

Our tool is composed of three notebooks: one to create simple patterns, one to combine and edit patterns, one to create 3D baskets using created patterns. Created patterns are saved locally as text files.

Distribution of the notebooks

The three notebooks are publicly available on a github repository
- ➢ Repo: https://github.com/cchauve/Callysto-Salish-Baskets
- ➢ Webpage: https://cchauve.github.io/Callysto-Salish-Baskets/

Potential users can download them, use them or modify them on a local desktop computer if jupyter is installed, or online using the Callysto hub.
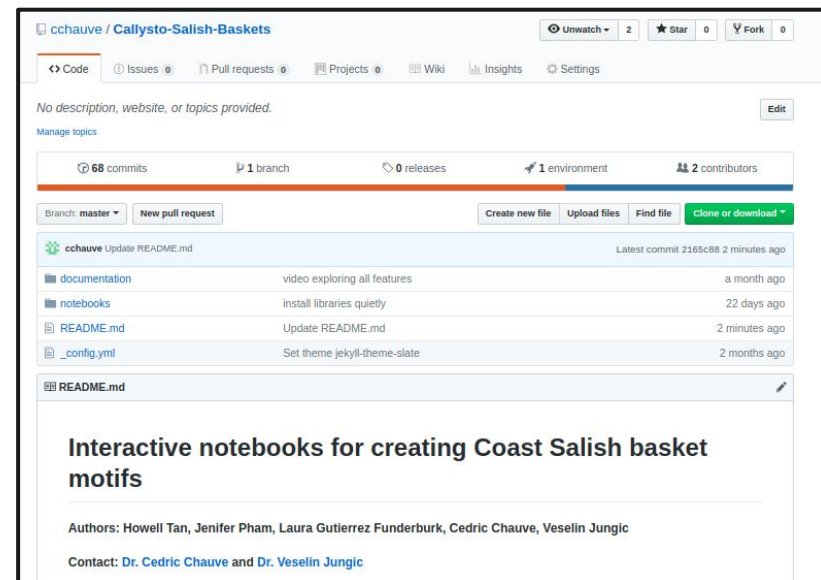
Time for a demo
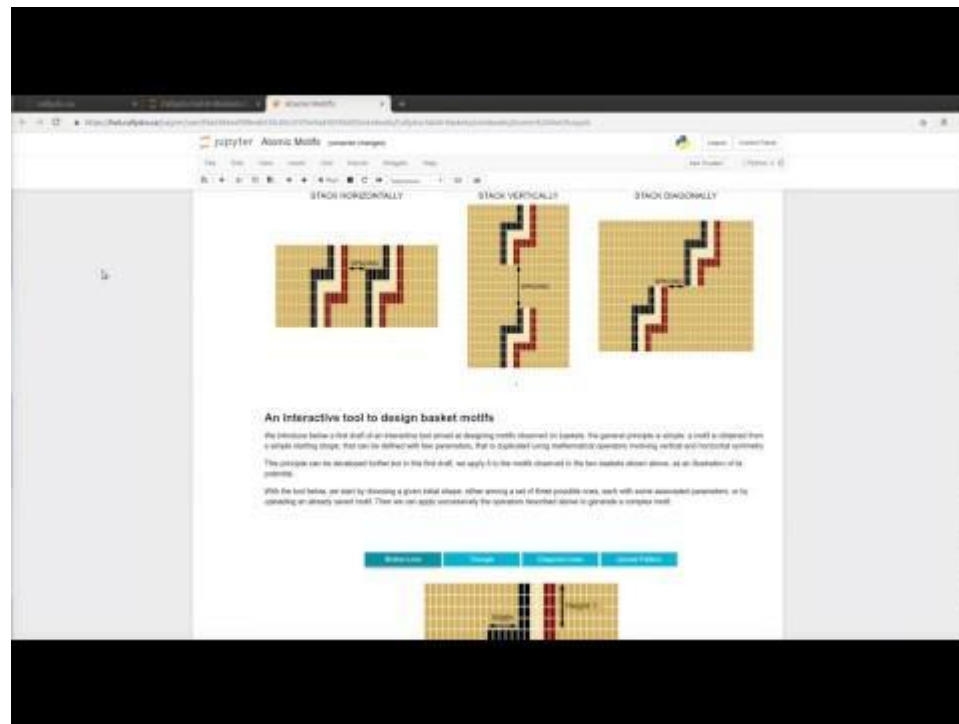
Future Work

Technical work:
➢ The code of the notebooks can likely be optimized to be faster.
➢ The 3D rendering tool is still quite preliminary, but appropriate libraries in python lack currently.
➢ The three notebooks could be integrated into a single notebook.

Diffusion:
➢ How to get this resources to teachers and to train them?
➢ How to install it on local school computers?

Conclusion

This tool was designed with reconciliation in mind: we learned about these beautiful baskets, something new for us, and tried to implement our understanding using mathematical concepts and tools we know well, with the aim to make it accessible to a wide audience.

We hope our tool, despite its shortcomings (that we plan to address), will be brought to many students, who will learn either about Salish baskets or about mathematics, through hands-on activities such as the reproduction or design of basket patterns.

Acknowledgments

Development team: Howell Tan, Jenifer Pham, Laura Gutierrez-Funderbunk

Tla'amin nation: Betty Wilson, Gail Blaine, Tyler Peters