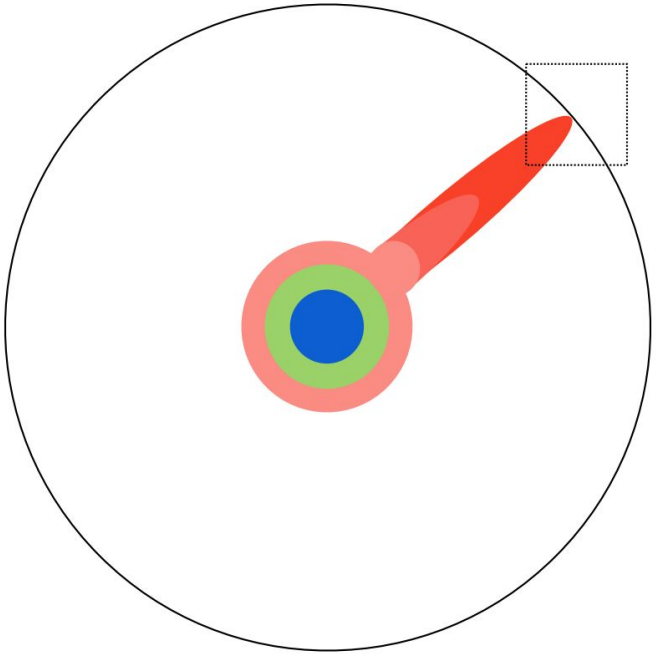
Software Gardening

CPBS 7601
Computing Skills in Biomedical Sciences
Lecture 11
Fall 2025

Outline

- Introduction
- Software Gardening
- The planter and the pruner
- Break
- Software tropism

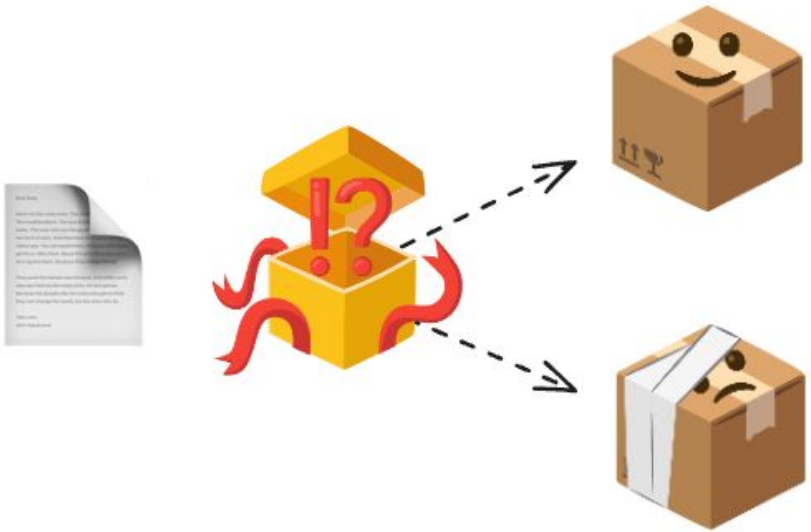
Introduction



We move forward through a wilderness as we develop software.

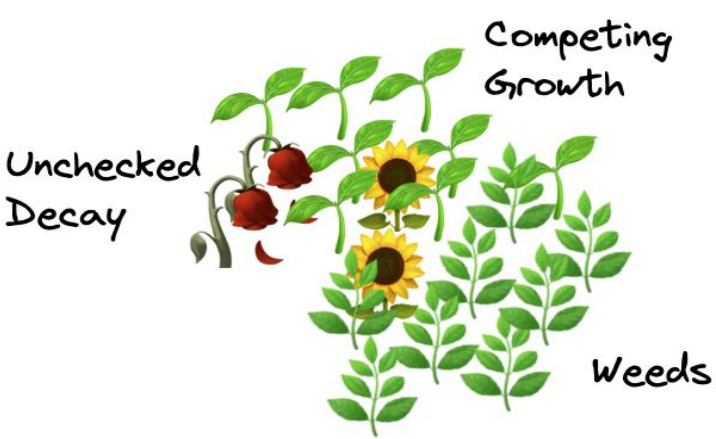
The illustrated guide to a Ph.D. (link)

Introduction

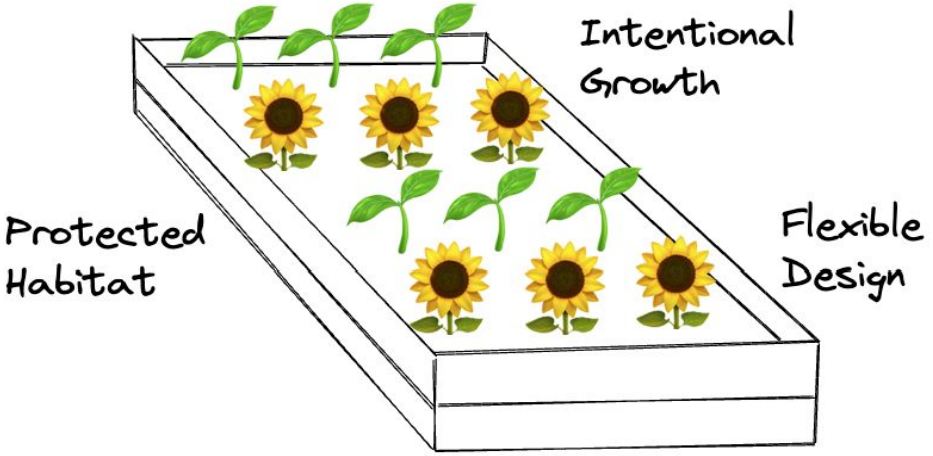


What kind of experience do we have when we open software cited in a manuscript?

Introduction



Software Wilderness



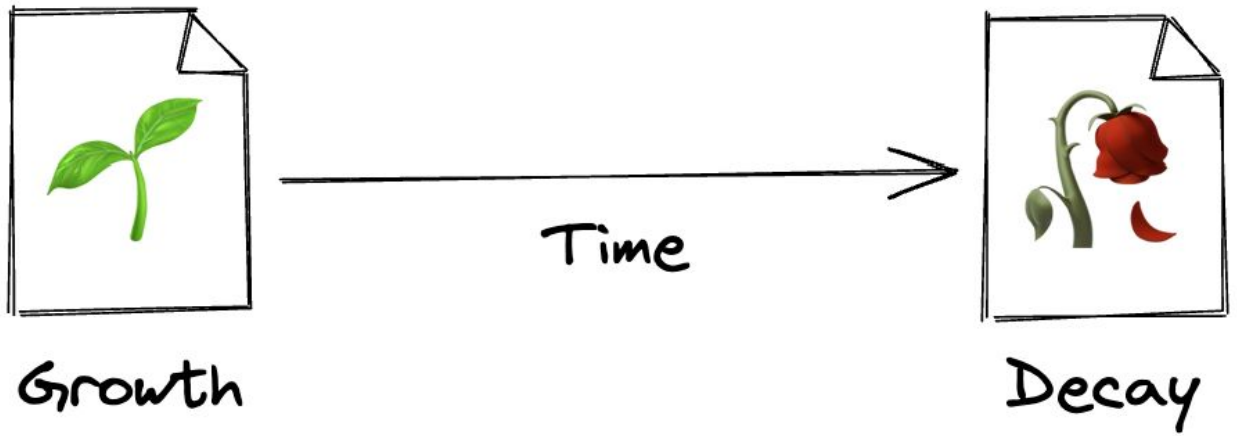
Software Garden

Software can be experienced as a wilderness or a garden.

Software Gardening

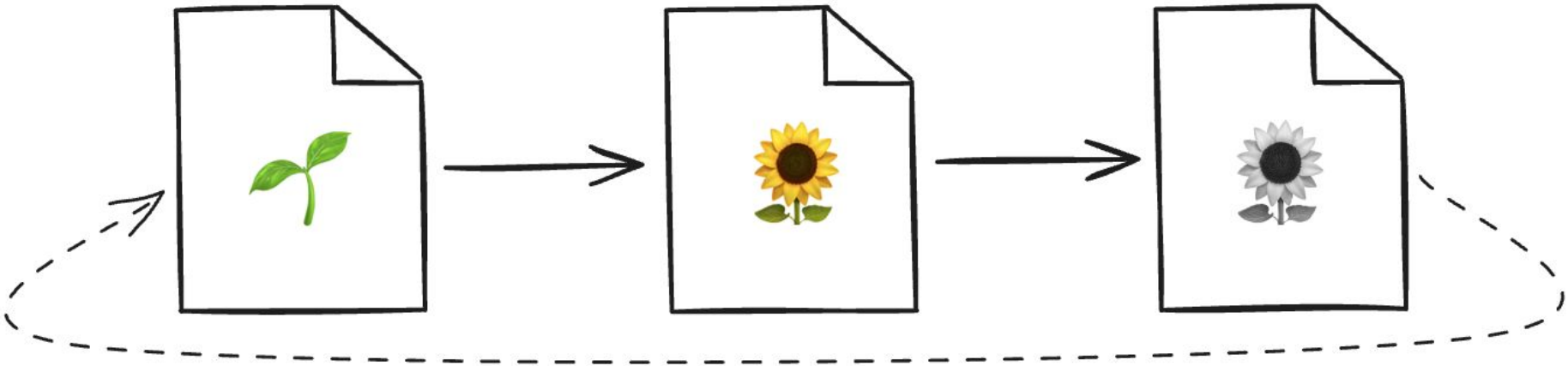
Image credit: Charles-François Daubigny

Introduction



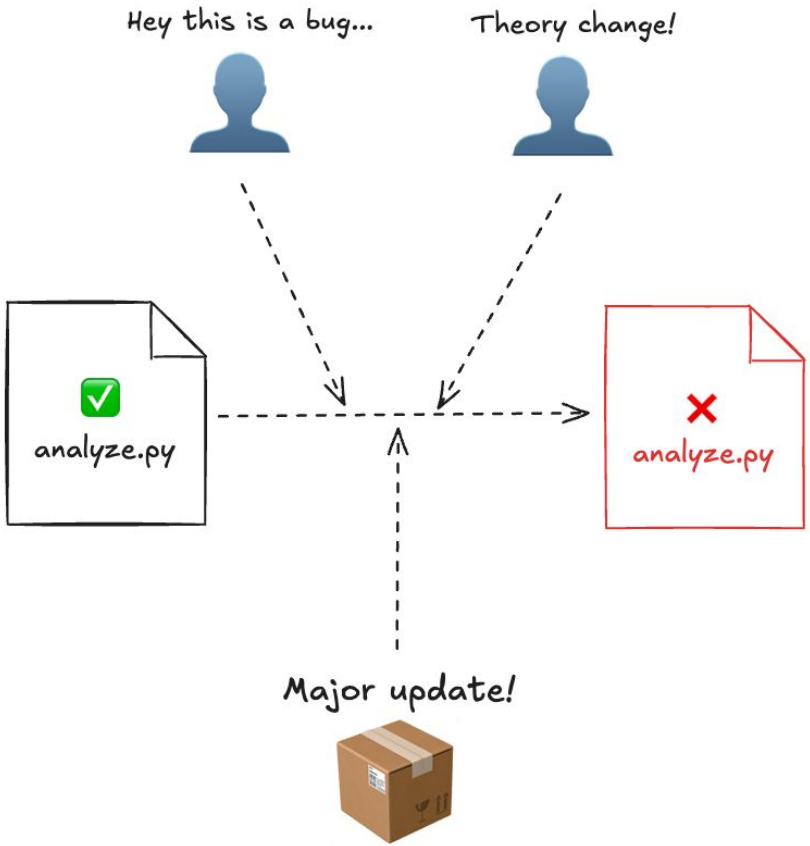
Time changes software.

Introduction

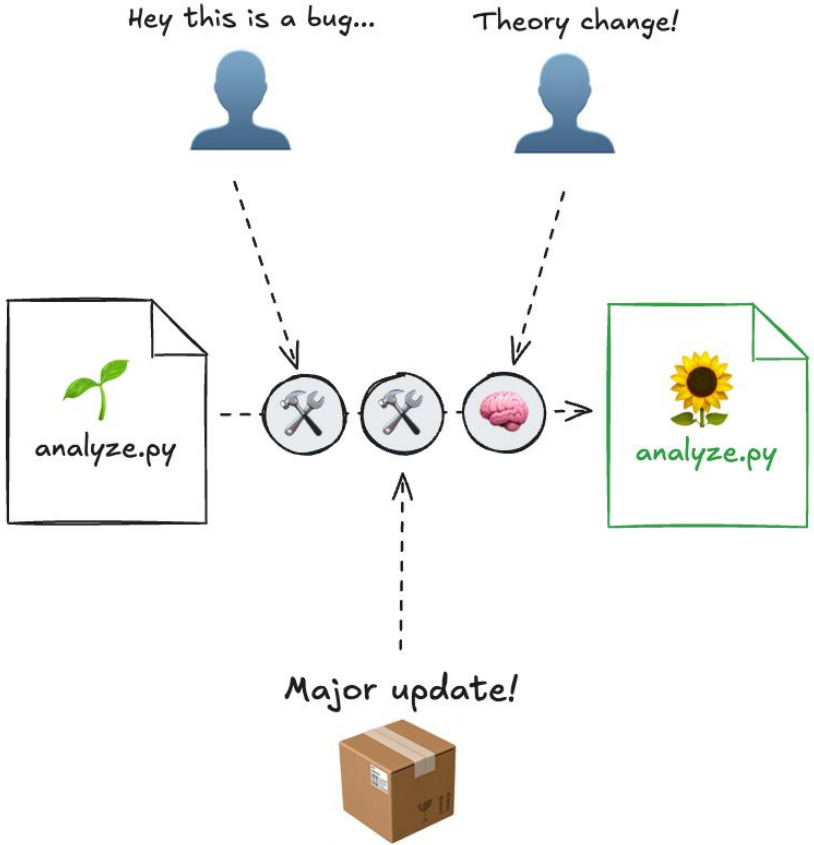


There are practices which we can use to enhance growth and recycle decay.

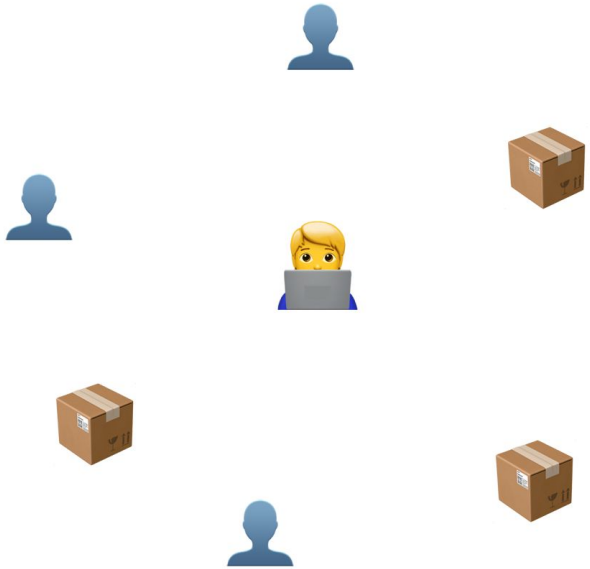
Introduction



Introduction



Software Gardening



Our projects are often a composite of efforts from other dependencies.

Code as a byproduct of social interaction

PETER NAUR, PROGRAMMING AS THEORY BUILDING

Peter Naur, widely known as one of the authors of the programming language syntax notation "Backus-Naur Form" (BNF), wrote "Programming as Theory Building" in 1985. It was reprinted in his collection of works, *Computing: A Human Activity* (Naur 1992).

This article is, to my mind, the most accurate account of what goes on in designing and coding a program. I refer to it regularly when discussing how much documentation to create, how to pass along tacit knowledge, and the value of the XP's metaphor-setting exercise. It also provides a way to examine a methodol-

"PROGRAMMING AS THEORY BUILDING"

Introduction

The present discussion is a contribution to the understanding of what programming is. It suggests that programming properly should be regarded as an activity by which the programmers form or achieve a certain kind of insight, a theory, of the matters at hand. This suggestion is in contrast to what appears to be a more common notion, that programming should be regarded as a production of a program and certain other texts.

https://pages.cs.wisc.edu/~remzi/Naur.pdf

Software Gardening

Files: > 2,000
Code lines: > 553,000
Commits: > 36,000
Issues: ~3,500
Open pull requests: ~140
Closed pull requests: > 34,000
Forks: ~19,000

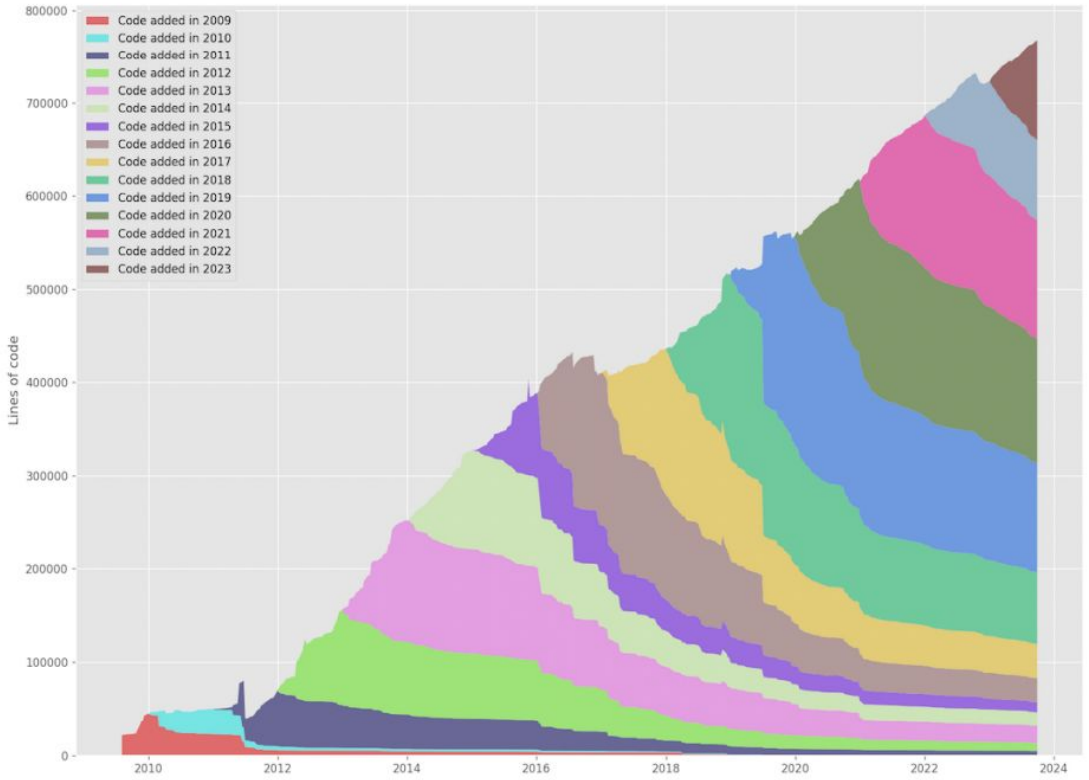
One person’s garden is another’s wilderness.

Software Gardening

Git-of-theseus analysis for Pandas.

Essential vs accidental properties.

Who holds the essential theory of Pandas?



Software Gardening

Figure: left

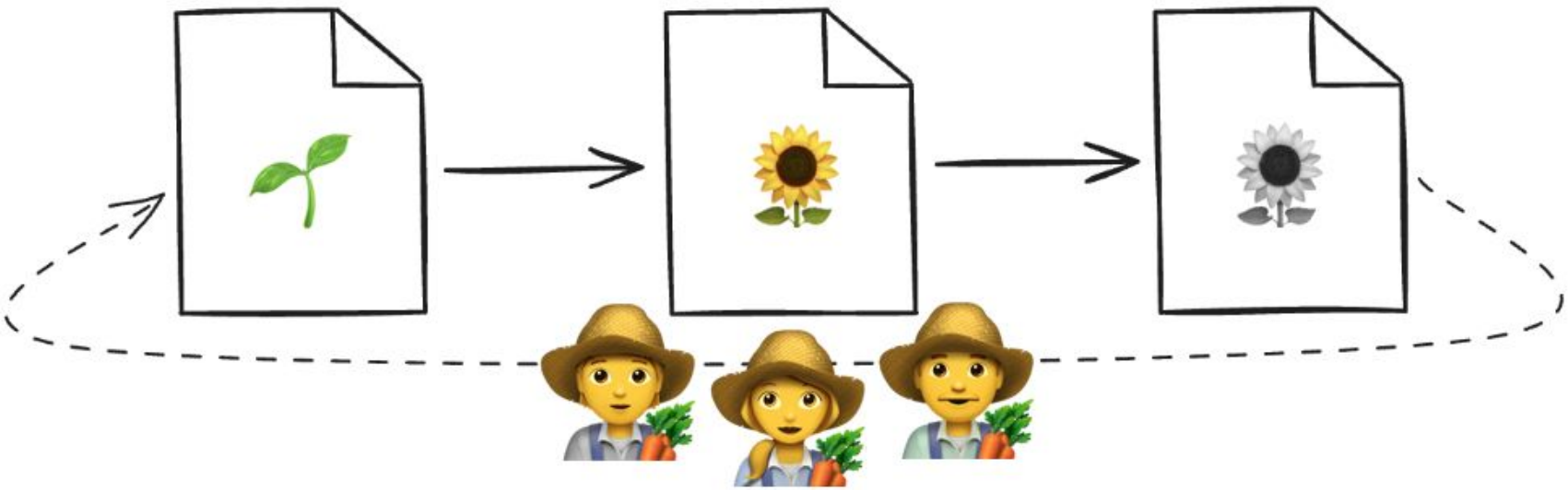
Replacement vs repair
"*Large-lump development is based on the fallacy that it is possible to build perfect buildings. Piecemeal growth is based on the healthier and more realistic view that mistakes are inevitable.*"

- Christopher Alexander, The Oregon Experiment

Software Gardening

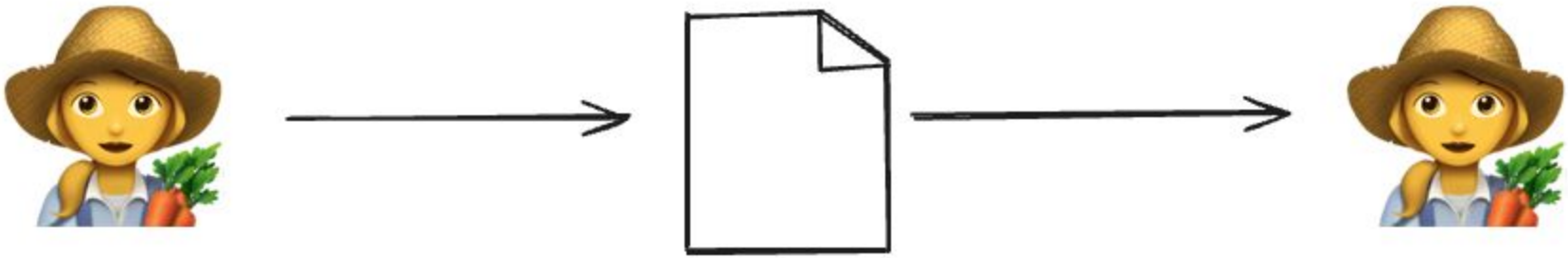
Who holds the essential theory of your projects?

Gardening lattice



We don’t have to go it alone.

Gardening lattice



What we create will be inherited by others.

Gardening lattice

Minor tweaks to sup fig 7 #58

Edit | <> Code

Merged **gwaybio** merged 1 commit into `WayScience:main` from `gwaybio:minor-fix-sup-fig7` on Mar 8, 2024

Conversation 4 | Commits 1 | Checks 0 | Files changed 3 | +174 −43

gwaybio commented on Feb 22, 2024 — Member

Main change is focus on AreaShape and Zernike features more closely in panels C and D, and also to combine old panels C and D into a single panel C

Supplementary Figure 7

Reviewers: jenna-tomkinson ✓

Assignees: No one—assign yourself

Labels: None yet

Projects

https://github.com/WayScience/phenotypic_profiling/pull/58

Gardening lattice

“The ‘planetary garden’ is a means of considering ecology as the integration of humanity – the gardeners – into its smallest spaces. Its guiding philosophy is based on the principle of **the ‘garden in motion’: do the most for, the minimum against.**”
- Gilles Clément

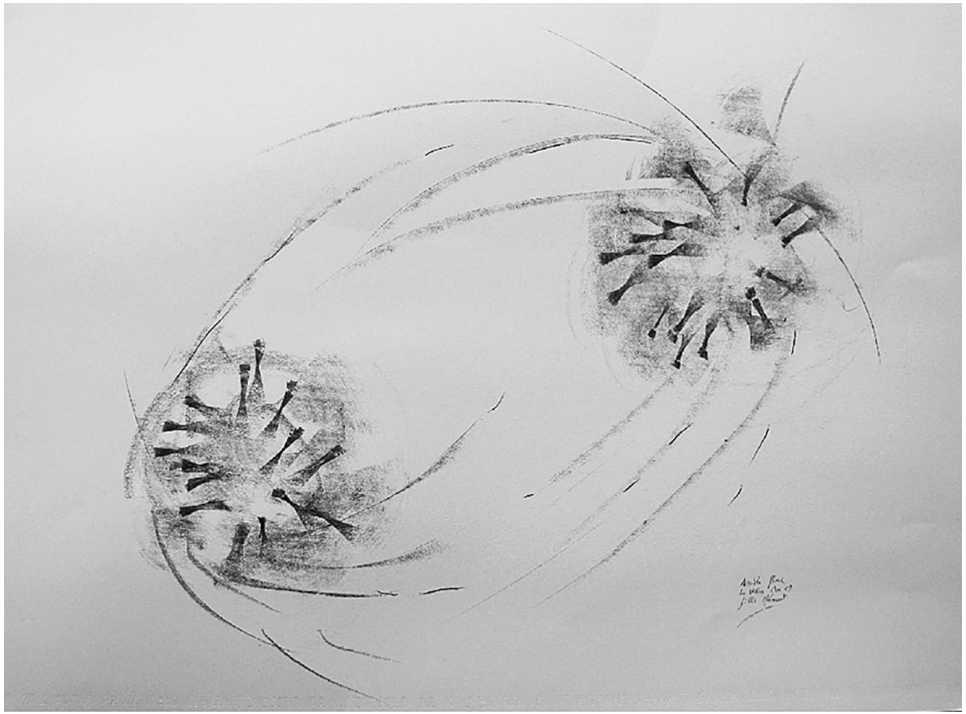


Figure: link

Gardening lattice

“Before you speak ask yourself if what you are going to say is **true**, is **kind**, is **necessary**, is **helpful**. If the answer is no, maybe what you are about to say should be left unsaid.”
- Bernard Meltzer

Gardening lattice

We benefit the most by “boosting” our and others works.

Image from:
https://www.digitalspy.com/videogames/retro-gaming/a622081/star-fox-64-retrospective-a-showcase-of-nintendo-64-potential/

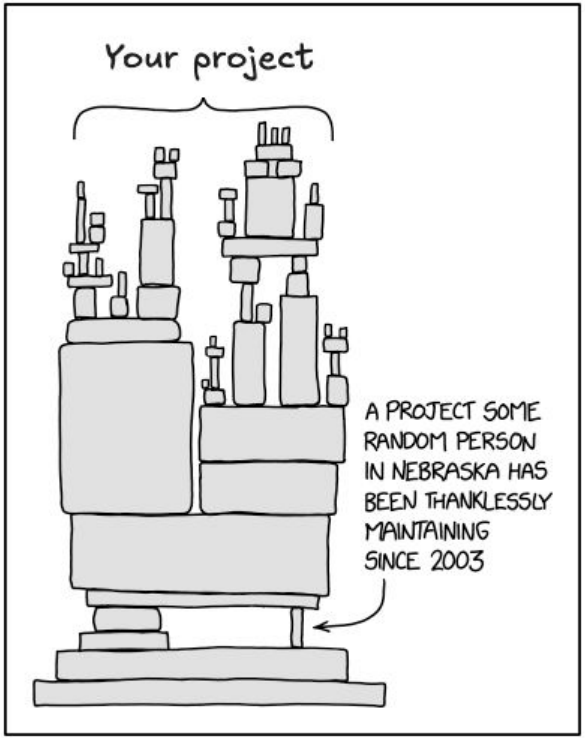
Demo: the 🌱Planter and the ✂️Pruner

Break (5 min)

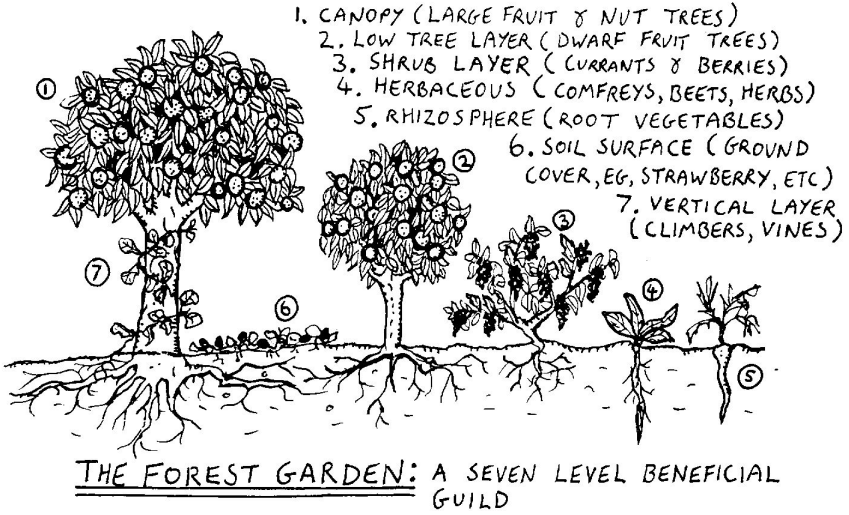
Software tropism

We build stacks which are vulnerable to a number of factors.

Modified from https://xkcd.com/2347/



Software tropism



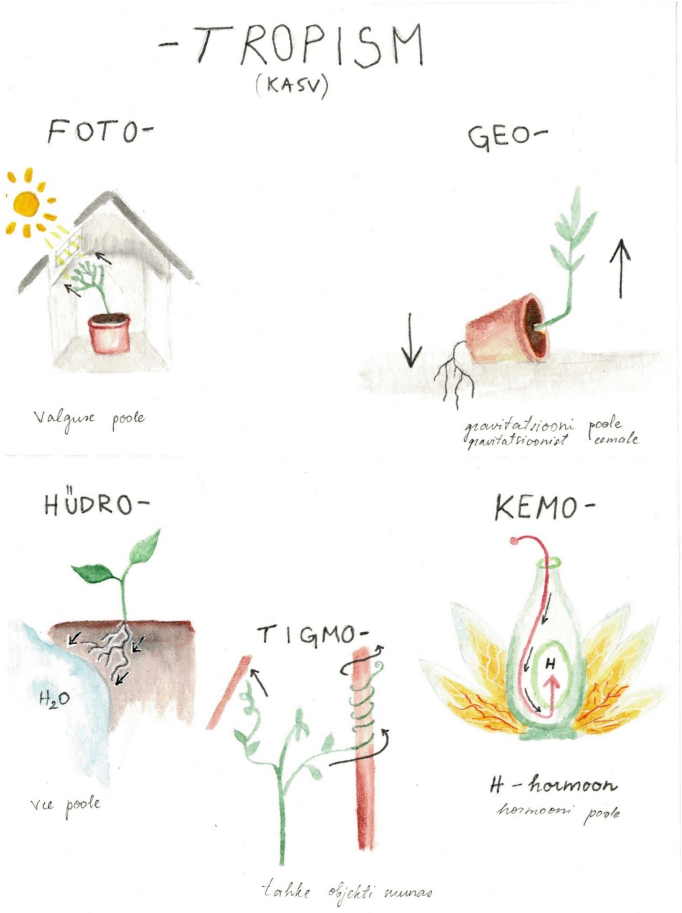
The garden forest: [re]balancing ecological interchange

Figures: left, right

Software tropism

Tropism: the turning of all or part of an organism in a particular direction in response to an external stimulus.

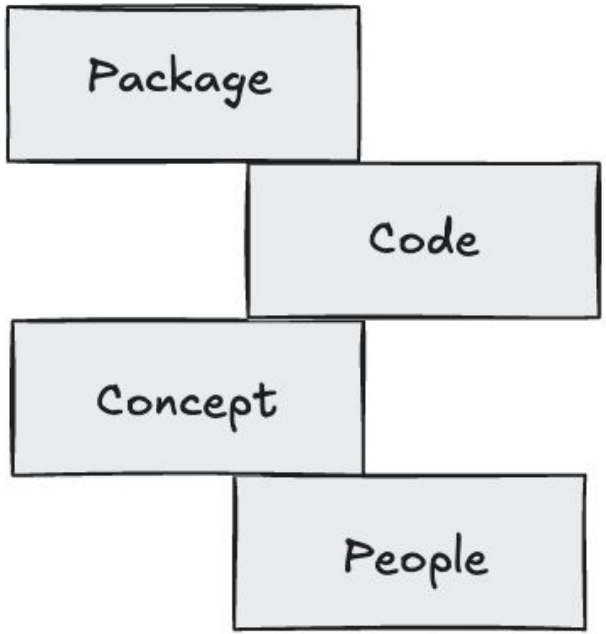
What types of tropisms dictate project growth (or decay)?



[Figure]

Software tropism

What does a project depend on to grow?



Assignment

Exploring Dependency Tropism