

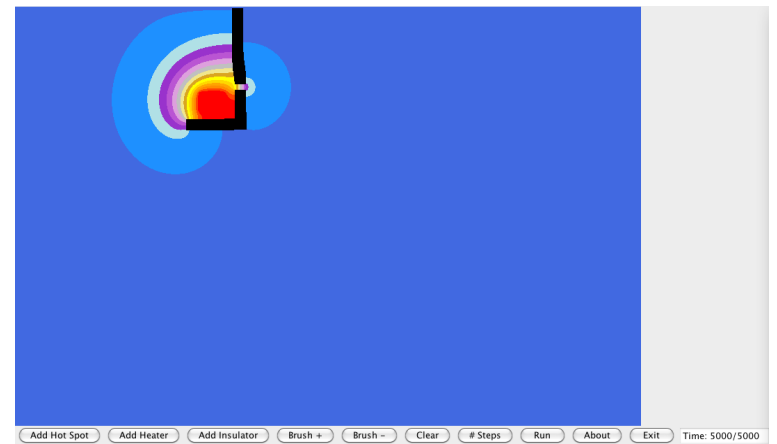
Peachy Assignments: Cool, Adoptable Parallel and Distributed Computing Assignments

<https://tcpp.cs.gsu.edu/curriculum/?q=peachy>

Peachy Assignments: Motivation

Good course assignments

- + Inspire students
- + Improve student learning
- + Are fun to give
- Are lots of work to create
- Don't always work as well as we thought



Successful assignments should be shared like

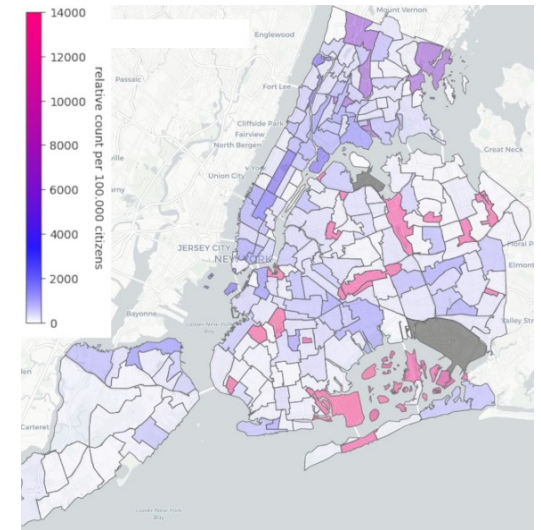
"Nifty Assignments" (<http://nifty.stanford.edu>)

Peachy Assignments

<https://tcpp.cs.gsu.edu/curriculum/?q=peachy>
(or Google Peachy assignment)

Peachy Assignments

- Selected competitively and presented at
 - EduPar (co-located with IPDPS in May)
 - EduHPC (co-located with SC in November)
- Available on the Peachy website
<https://tcpp.cs.gsu.edu/curriculum/?q=peachy>
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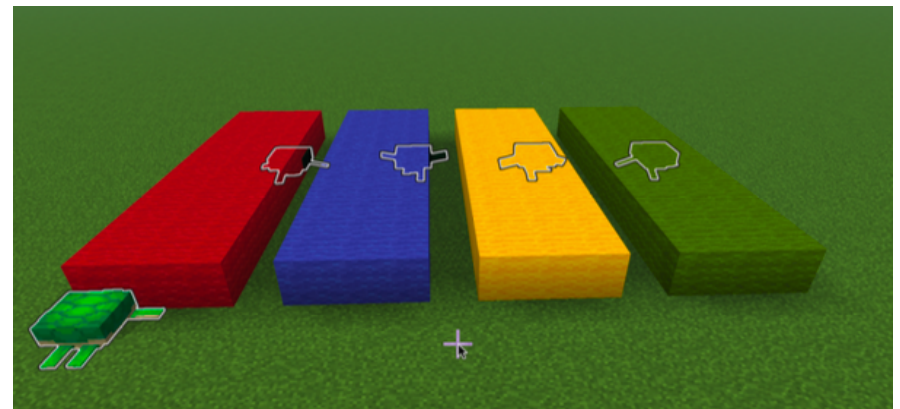
Peachy Assignment Criteria

- Tested
 - Used in the classroom and comes with instructor reflections
- Adoptable
 - Includes handout and given code for students, plus optional solution
 - Description discusses prerequisites and options for adaptation
 - Widely-taught concepts using readily available hardware
- Cool and inspirational
 - Fun and exciting for students
 - Ideally, something they show their roommates

Sample Peachy Assignment: 3D turtles in Minecraft

(Jurdana Masuma Iqrah, Jaime Spacco, Michael Gerten, EduPar 2026)

- Students write code (Java, Python, et al.) to control a “turtle” in Minecraft
- Drawing happens in a modded Minecraft server, which students can view in unmodified client
- Can create multiple turtles to draw in parallel



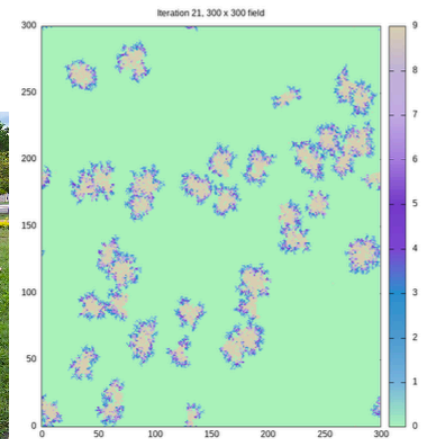
Sample Peachy Assignment: Fairy Rings

(Elizabeth Shoop, EduHPC 2025)

- 2D discrete event simulation of fairy ring growth
- Similar feel to “Game of Life”, but more states and probabilistic



(a) A real fairy ring [1]

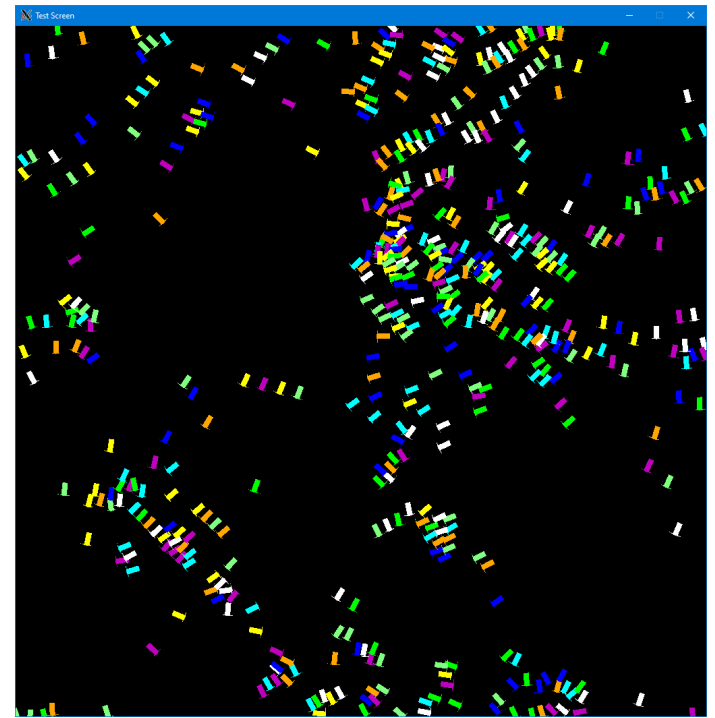


(b) Simulated rings

Sample Peachy Assignment: Visualizing parallelism with a flocking algorithm

(Elizabeth Shoop and Ethan Scheelk, EduPar 2024)

- “boids” flocking model by Reynolds and Flake
 - Each has random initial position and velocity
 - Updated each time step based on behavior of the others
- Students are given serial code and need to analyze where to apply parallelism using OpenMP
 - Result is visibly faster

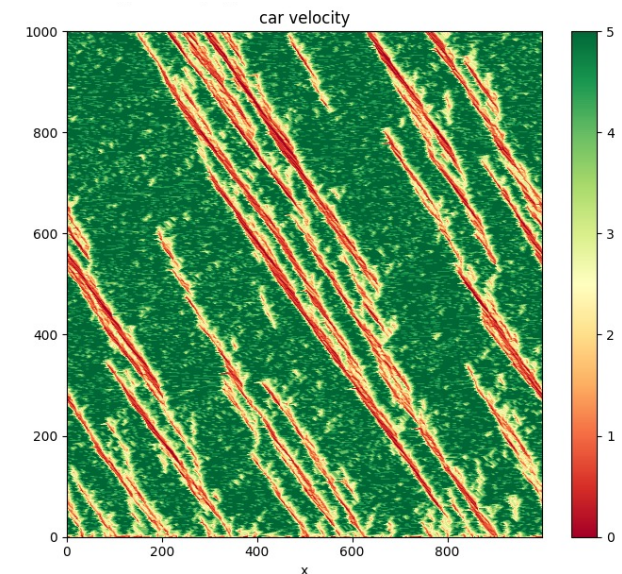


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Sample Peachy Assignment: Traffic Jam Modeling

(Ramses von Zon and Marcelo Ponce, EduHPC23)

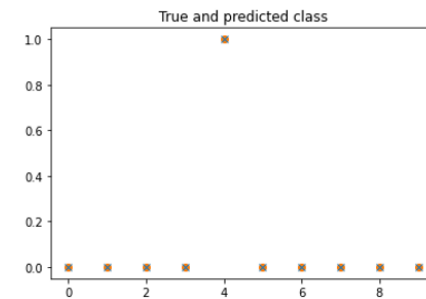
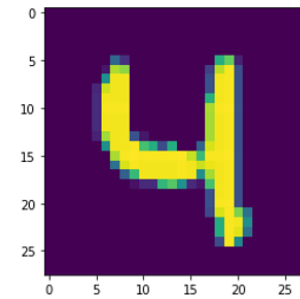
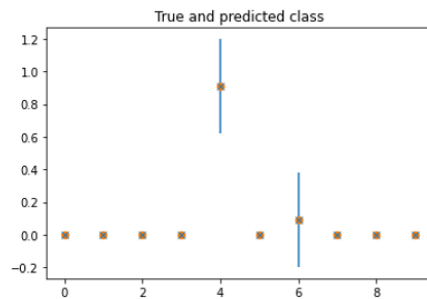
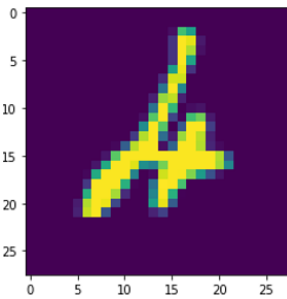
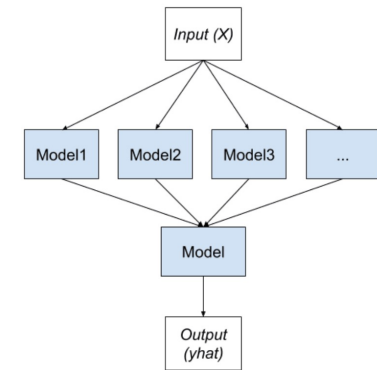
- Nagel-Schreckenberg traffic model
 - Chain of cars in one lane, each following simple update rules for their speed
- Focus on parallel pseudorandom number generation
- Parallelize C++ using OpenMP (MPI or CUDA are suggested variants)



Sample Peachy Assignment: Uncertainty Estimation for Deep Learning

(Pautsch, Li, Rizzi, Thiruvathukal, and Pantoja; EduHPC 23)

- Using ensemble of neural networks to estimate confidence in output
- Train models independently in parallel using Python



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Sample Peachy Assignment: Colliding Spheres

(Iliopoulos, Leiserson, Park, Rosa, and Schadl; EduHPC 22)

- N-body simulation with gravity and elastic collisions
- Parallelize given C++ using Cilk++ (OpenMP is suggested variant)
- Contest to complete as many test inputs as possible in given time

