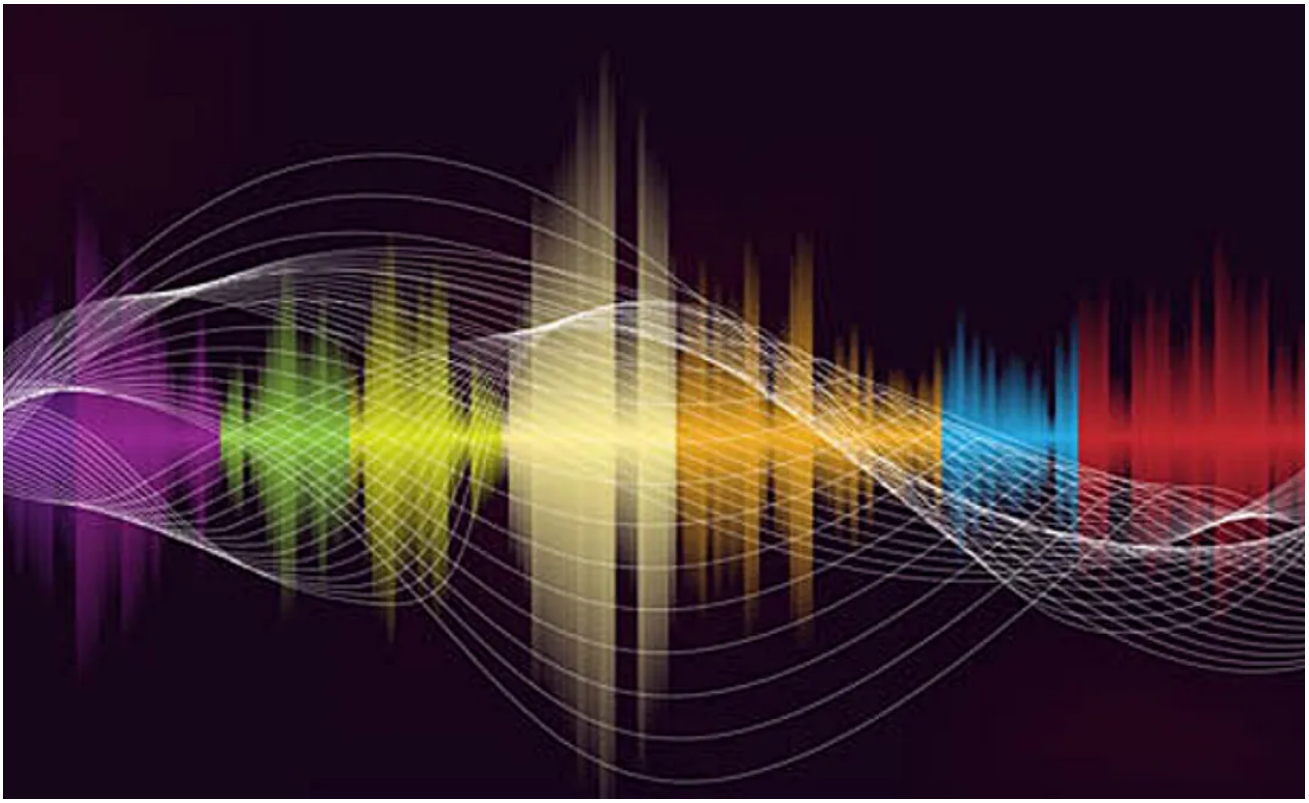


Fourier Series in C++ ImGui

Markus Buchholz · Follow
2 min read · Mar 1, 2023

Listen Share

Fourier series for the periodic function is the sum of sine and cosine curves. Generally speaking, each periodic signal is composed of sine functions (with different oscillation periods).
I provided an extensive introduction to signal processing here, where we could see how to design a digital filter.

In the following article, I use the square wave which shape can be composed by adding sine signals according to the following formula (in frequency domain). The other function you will find here (Table of common Fourier series) — in our

example, we use function nr 6 (see table).

$$f(x) = \sum_{n=1,3,5,7\ldots}^{\infty} \left(\frac{4}{\pi \cdot n}\right) \cdot sin\left(\frac{n \cdot \pi \cdot x}{P}\right)$$

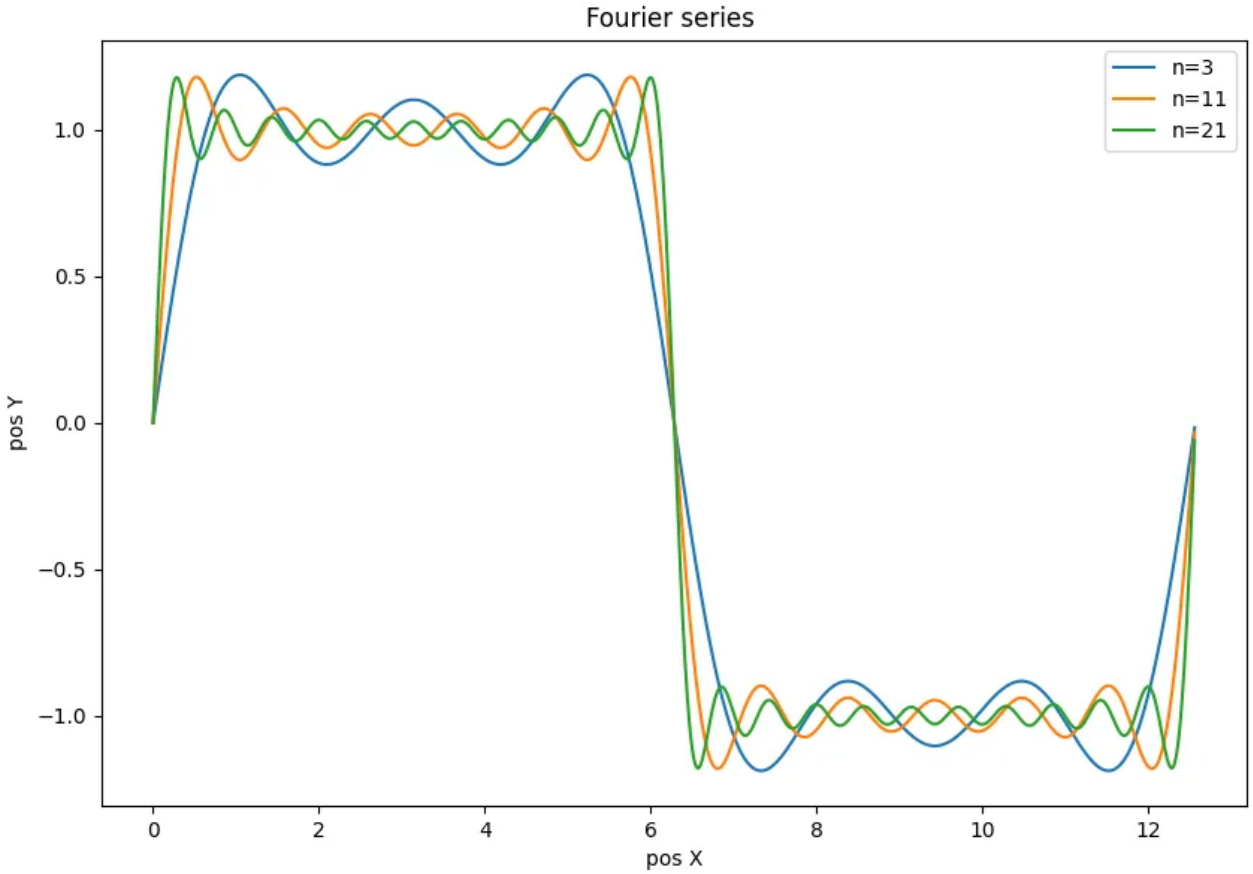
A sine wave may be compared to the point which rotates on the circle with the radius r which is associated with the amplitude of the sine signal. The speed of point rotation on the circle equals the sine signal period P (one rotation is the one period).
Adding additional sine waves, we can approximate better our reference signal (here the square wave). More sine signal causes us to add more circles with a smaller radius.
Decreasing the circle radius affects the speed rotation of the point around the original circle (the smaller circle the point rotates at a faster rate.
These rotating circles are occurring more frequently and in odd numbers. The function that we started with becomes closer when additional circles (more sines) are added (simulate in C++ ImGui).

The introduction to the C++ ImGui and information on how to compile and build programs you will find in one of my previous articles.

The source code you will find on my **GitHub**.

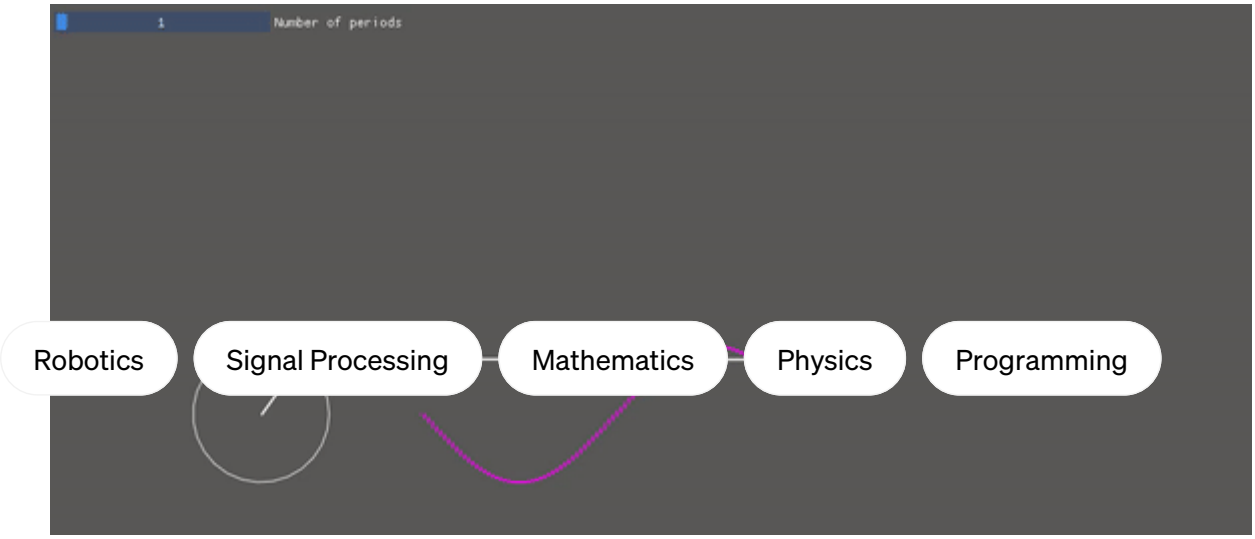
Simulations

The below figure depicts the relationship between the number of sine waves added together and the shape of the final function. As we discussed above more sine waves better approximation.



Fourie series of the square wave (by author)

Below I depicted the demonstration of the simulation in C++ ImGui.
On the many panels, you can choose the number of harmonically related sine waves whose sum approximates the square wave (more harmonics better approximation).



Simulation of Fourier series (by author)

Thank you for reading.

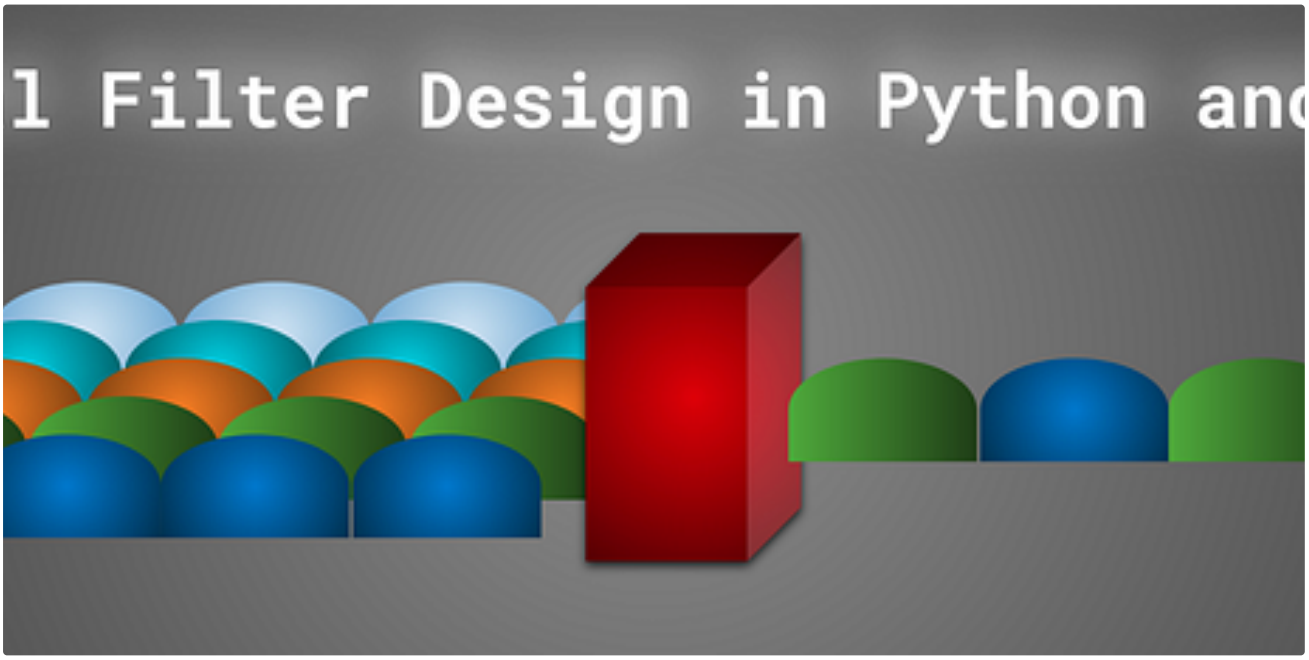
Follow

Written by Markus Buchholz

822 Followers

Researcher in underwater robotics

More from Markus Buchholz

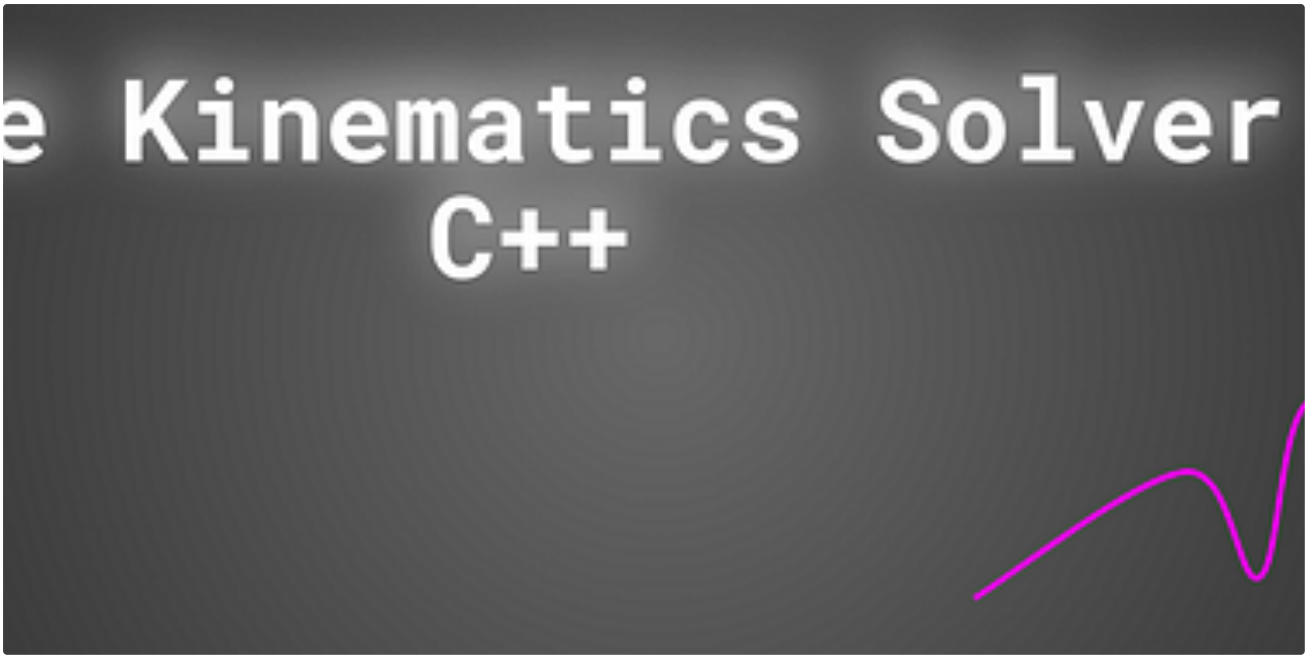


Markus Buchholz in Geek Culture

Digital Filter Design in Python and C++

In following article I will demonstrate a general approach of digital filters design. The goal for the filter is to remove particular...

Sep 4, 2021 104 2



Markus Buchholz in Geek Culture

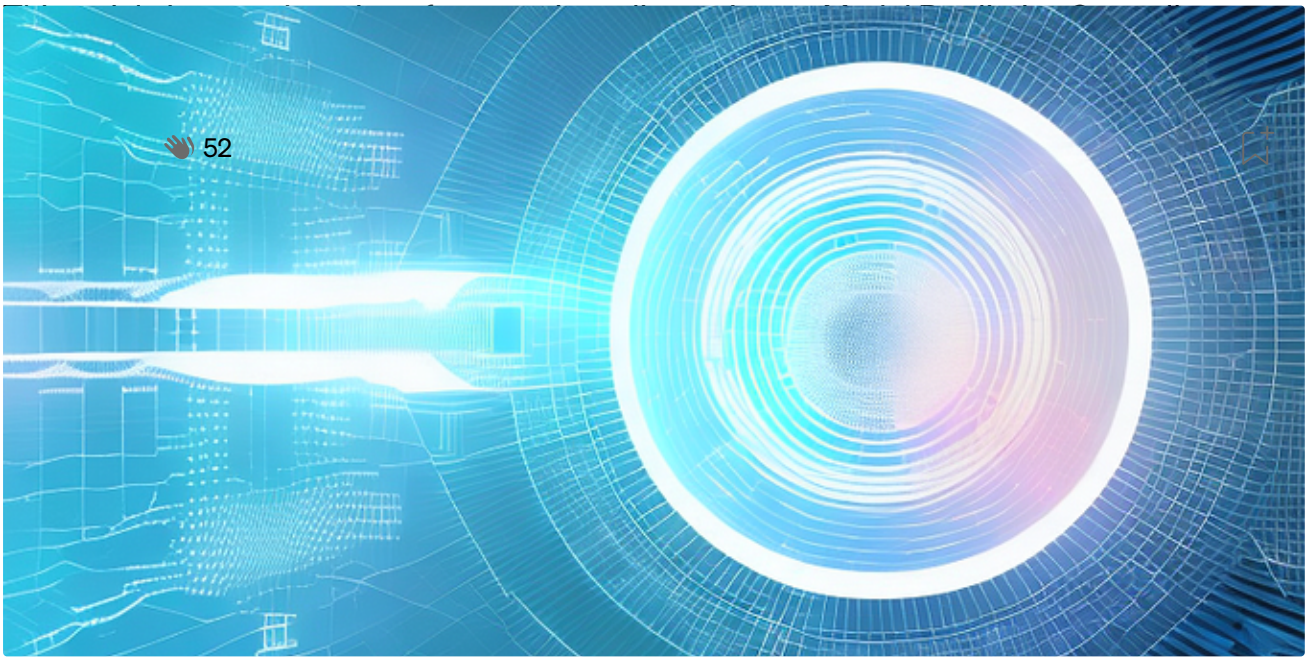
Inverse Kinematics Solver in C++

In this article I will demonstrate you how to approach a solution of inverse kinematics for the manipulator (industrial robot). The...

Jan 14, 2022 75

Markus Buchholz

Model Predictive Path Integral (MPPI) Control in C++



Markus Buchholz

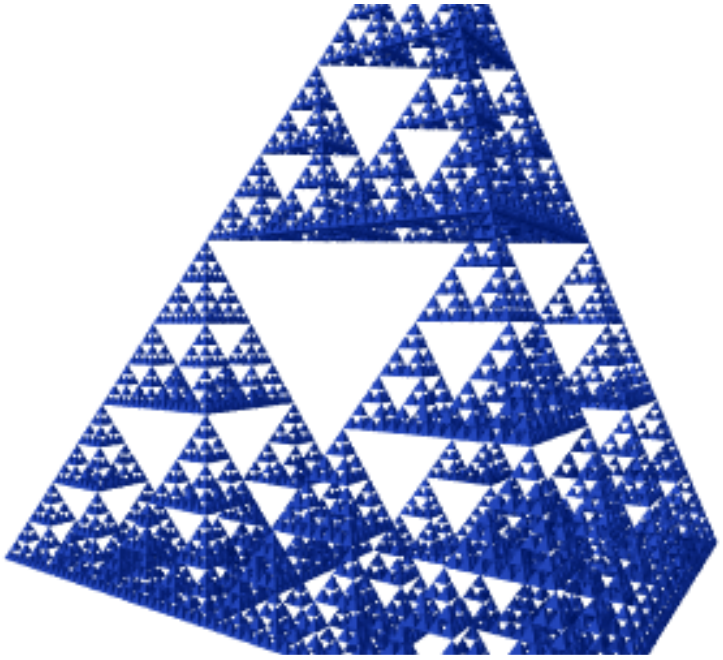
Model Predictive Control in C++

The following article describes a simple control system approach where the Model Predictive Controller is applied. The article discusses...

Aug 18, 2023 41 1

See all from Markus Buchholz

Recommended from Medium

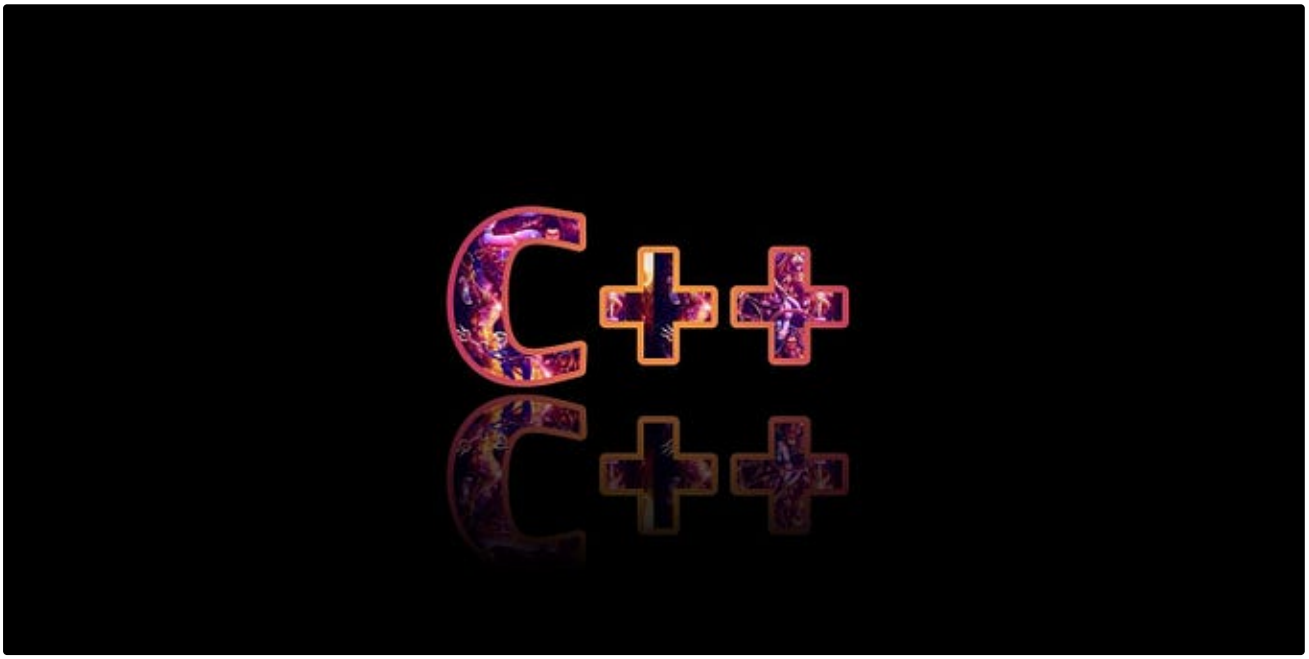


Martin McBride in Graphic maths

Fractal dimension of self-similar fractals

In geometry, we often deal with 2-dimensional or 3-dimensional objects. Sometimes we look at 1-dimensional objects, and less often we might...

Mar 1 19



LEARN TO CODE

12 Mind-Blowing C++ Techniques You Won’t Believe You Didn’t Know!

C++ is a powerful and complex programming language that continues to evolve, offering developers a wide array of tools and techniques to...

Lists

Jul 18 1

General Coding Knowledge

20 stories · 1423 saves

Coding & Development

11 stories · 712 saves

Stories to Help You Grow as a Software Developer

19 stories · 1225 saves

ChatGPT

21 stories · 731 saves

Kaan Alper Ucan in Python in Plain English

Basic Monte Carlo Simulations Using Python

Monte Carlo simulation, named after the famous casino in Monaco, is a computational technique widely used in various fields such as...

Mar 25 62

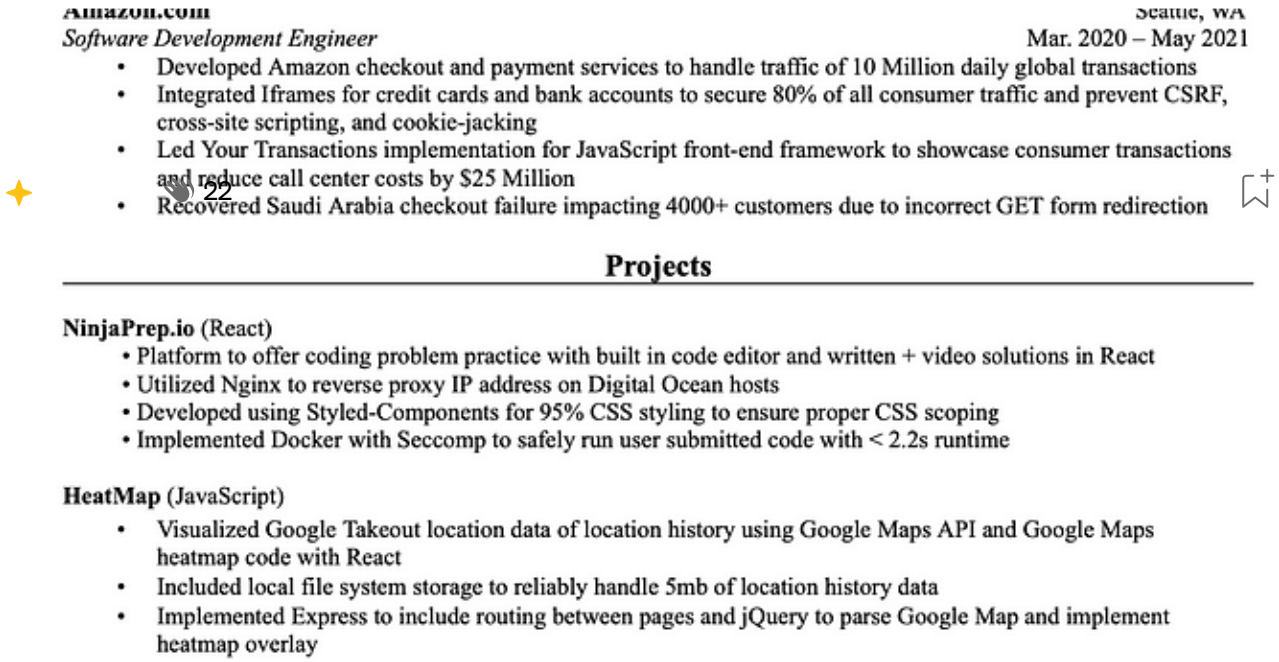
Jason Bowling in Exploring ROS Robotics

How To Add A Motor Controller To Your ROS Robot

Give your robot straight, precise driving and odometry!

Sep 25, 2022 403

Gealleh



Amazon.com Seattle, WA
Software Development Engineer Mar. 2020 – May 2021

- Developed Amazon checkout and payment services to handle traffic of 10 Million daily global transactions
- Integrated Iframes for credit cards and bank accounts to secure 80% of all consumer traffic and prevent CSRF, cross-site scripting, and cookie-jacking
- Led Your Transactions implementation for JavaScript front-end framework to showcase consumer transactions and reduce call center costs by $25 Million
- Recovered Saudi Arabia checkout failure impacting 4000+ customers due to incorrect GET form redirection

Projects

NinjaPrep.io (React)
- Platform to offer coding problem practice with built in code editor and written + video solutions in React
- Utilized Nginx to reverse proxy IP address on Digital Ocean hosts
- Developed using Styled-Components for 95% CSS styling to ensure proper CSS scoping
- Implemented Docker with Seccomp to safely run user submitted code with < 2.2s runtime

HeatMap (JavaScript)
- Visualized Google Takeout location data of location history using Google Maps API and Google Maps heatmap code with React
- Included local file system storage to reliably handle 5mb of location history data
- Implemented Express to include routing between pages and jQuery to parse Google Map and implement heatmap overlay

22

Alexander Nguyen in Level Up Coding

The resume that got a software engineer a $300,000 job at Google.

1-page. Well-formatted.

Jun 1 14.7K 225

See more recommendations