



# QUADTREE VISUALIZER

## Major Project

**Department of Computer Engineering**  
**TERNA ENGINEERING COLLEGE**  
Nerul (W), Navi Mumbai 400706

### REVIEW PRESENTATION

**Group ID: PHI – CS 73**

Group Members:

Under the Guidance of :  
Prof. Randeep Kaur Kahlon

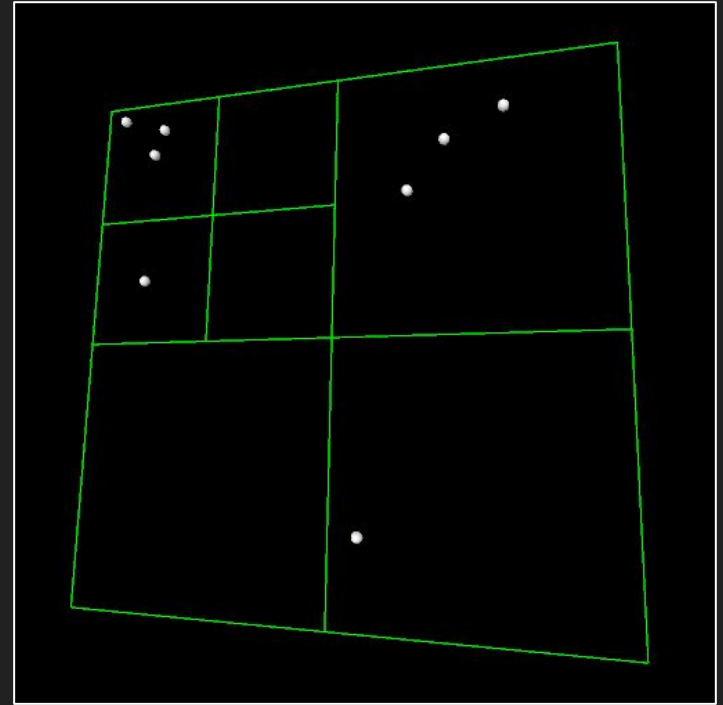
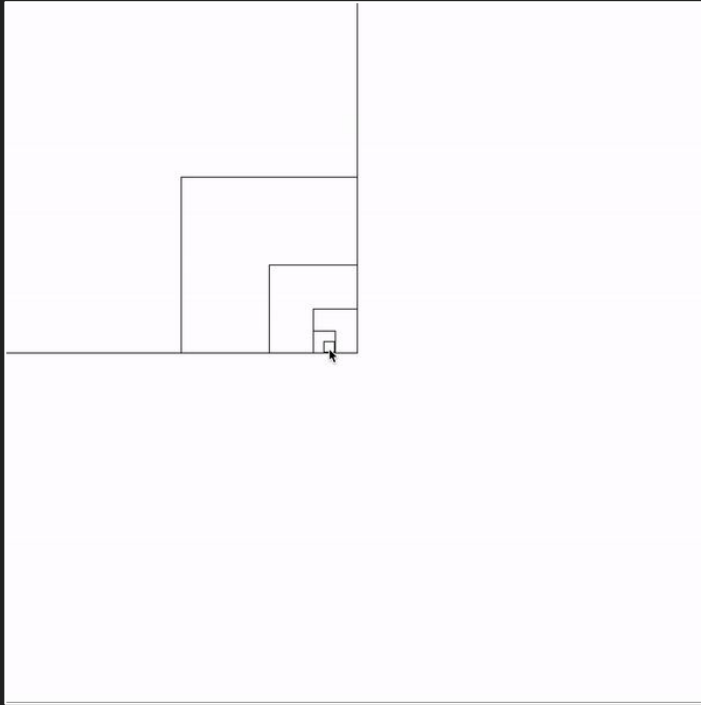
Amey Thakur	B-50
Hasan Rizvi	B-51
Mega Satish	B-58
Ajay Davare	B-01

# QUADTREE VISUALIZER

Major Project

*Project by:*

AMEY THAKUR	TE COMPS B-50	TU3F1819127
HASAN RIZVI	TE COMPS B-51	TU3F1819130
MEGA SATISH	TE COMPS B-58	TU3F1819139
AJAY DAVARE	TE COMPS B-01	TU3F1718006



An application capable of presenting a view of the QuadTree.

Design and development of QuadTree view and data model.

## ABSTRACT

- Develop a program that can show a QuadTree view and data model architecture using a single global library.
- Many digital map applications have the need to present large quantities of precise point data on the map. Such data can be weather information, the population in towns, etc. With the development of Internet of Things, we expect such data will grow at a rapid pace. How to visualize such magnitude of data on mobile devices and web browsers becomes a problem.
- This project aims to build an efficient library for interactively visualizing such data, using a combination of grid-based clustering and hierarchical clustering, along with quadtree spatial indexing.

# OBJECTIVES

This project's objective is to provide a single global library that can be shared, reused, and readily accessed.

Quadtree aims to be:

- Versatile (can be used in dynamic and static contexts)
- Simple
- Lightweight
- Easy to use
- Fast
- Header only
- Implemented with modern C/C++ features

# LITERATURE SURVEY

QuadTree is dead!!



I'm Dead, Now What?

**TYPES** – Point Quadtree, Edge Quadtree, Polygonal Map QuadTree.

All forms of quadtrees share some common features:

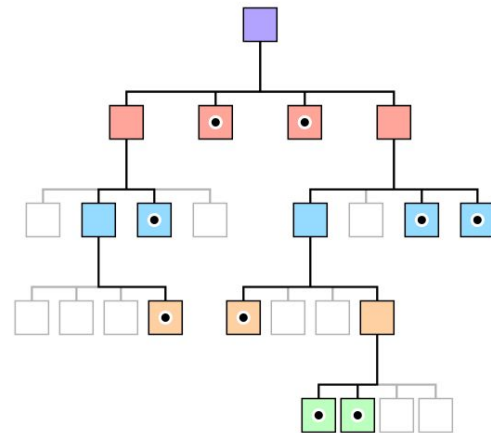
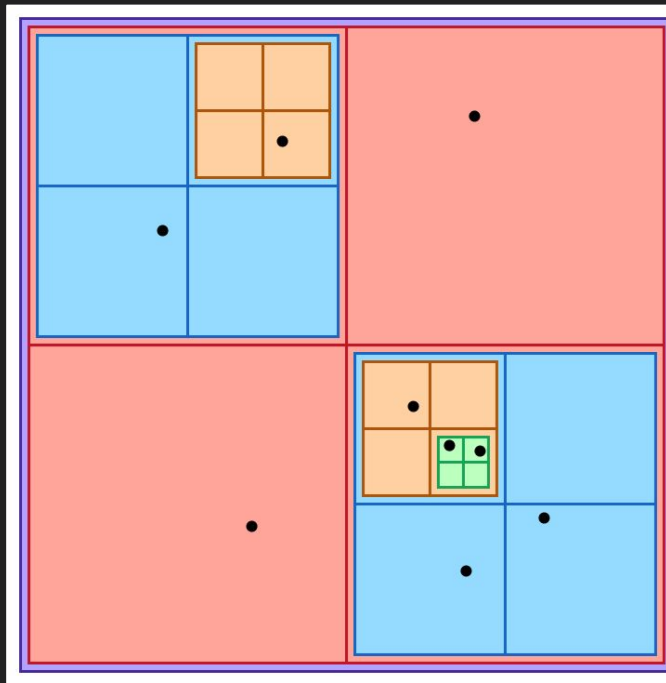
- They decompose space into adaptable cells.
- Each cell (or bucket) has a maximum capacity. When maximum capacity is reached, the bucket splits.
- The tree directory follows the spatial decomposition of the quadtree.

So to speak in layman's term, A *quadtree* is a tree whose nodes either are leaves or have 4 children. The children are ordered 1, 2, 3, 4.

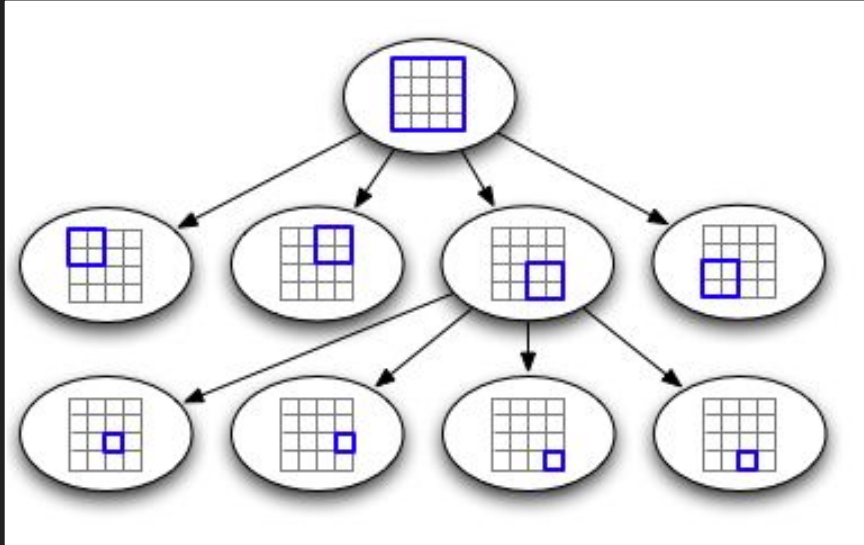
## What is QuadTree?



A data structure for  
organizing objects based on  
their locations in a  
two-dimensional space.



A similar partitioning is also known as a *Q-tree*.



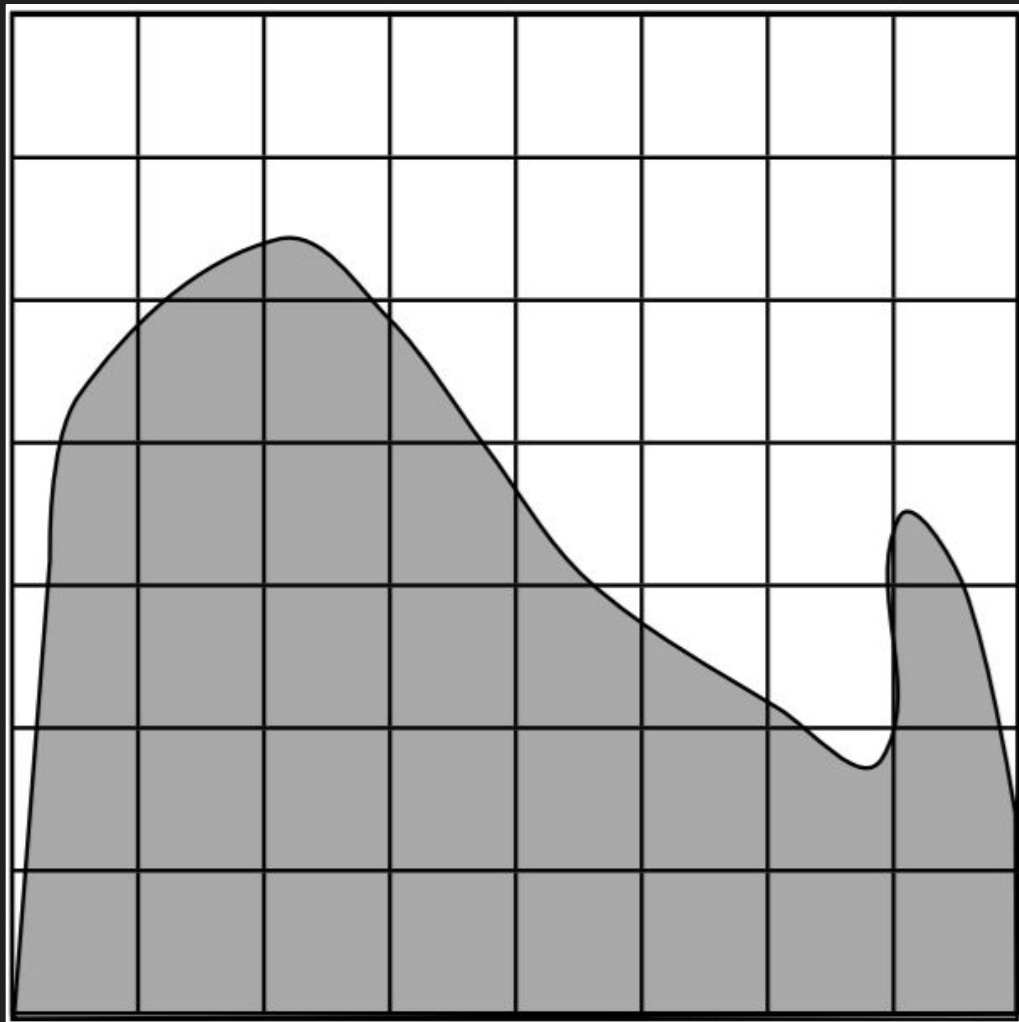
The quadtree partitioning strategy divides space into four quadrants at each level. When a quadrant contains more than one object, the tree subdivides that region into four smaller quadrants, adding a level to the tree.



How does QuadTree Works?



Subdivide into uniform blocks

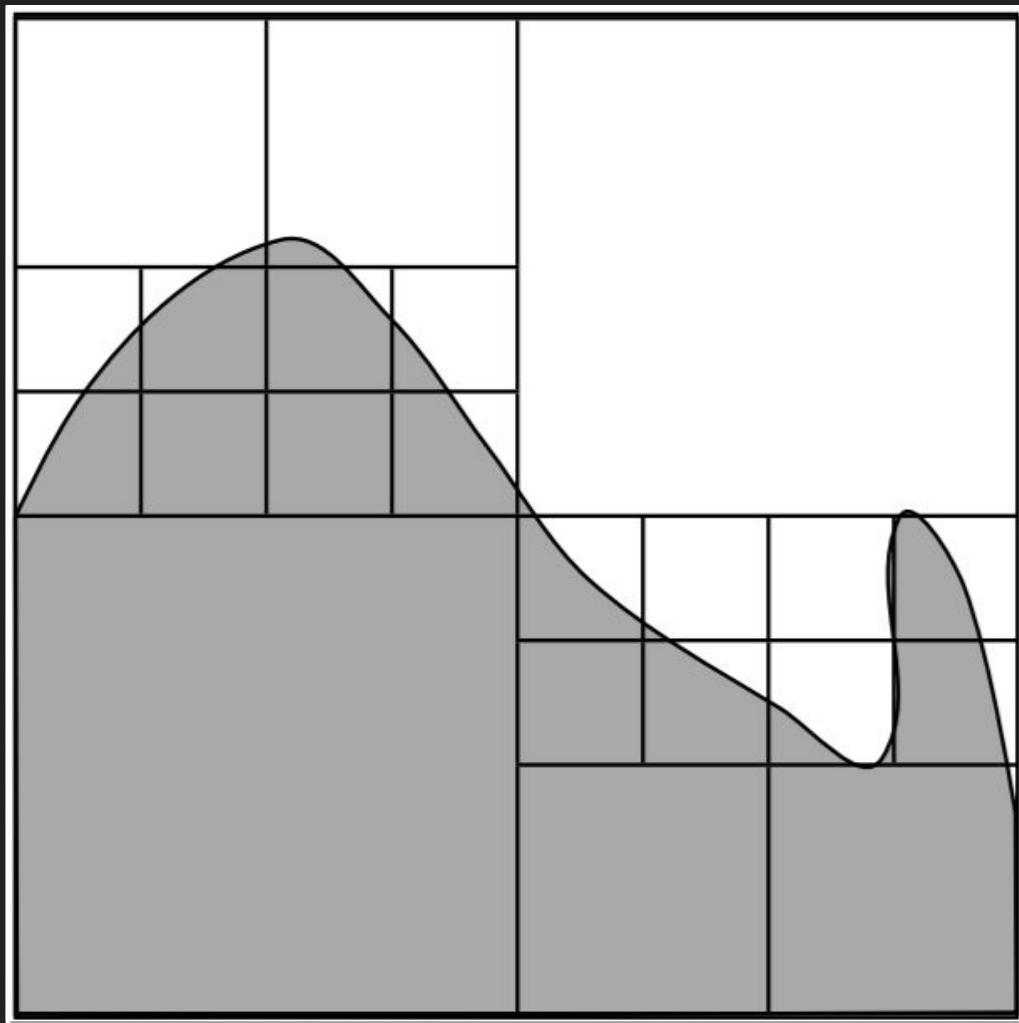


How does QuadTree Works?



Subdivide into uniform blocks

Merge Similar Brothers



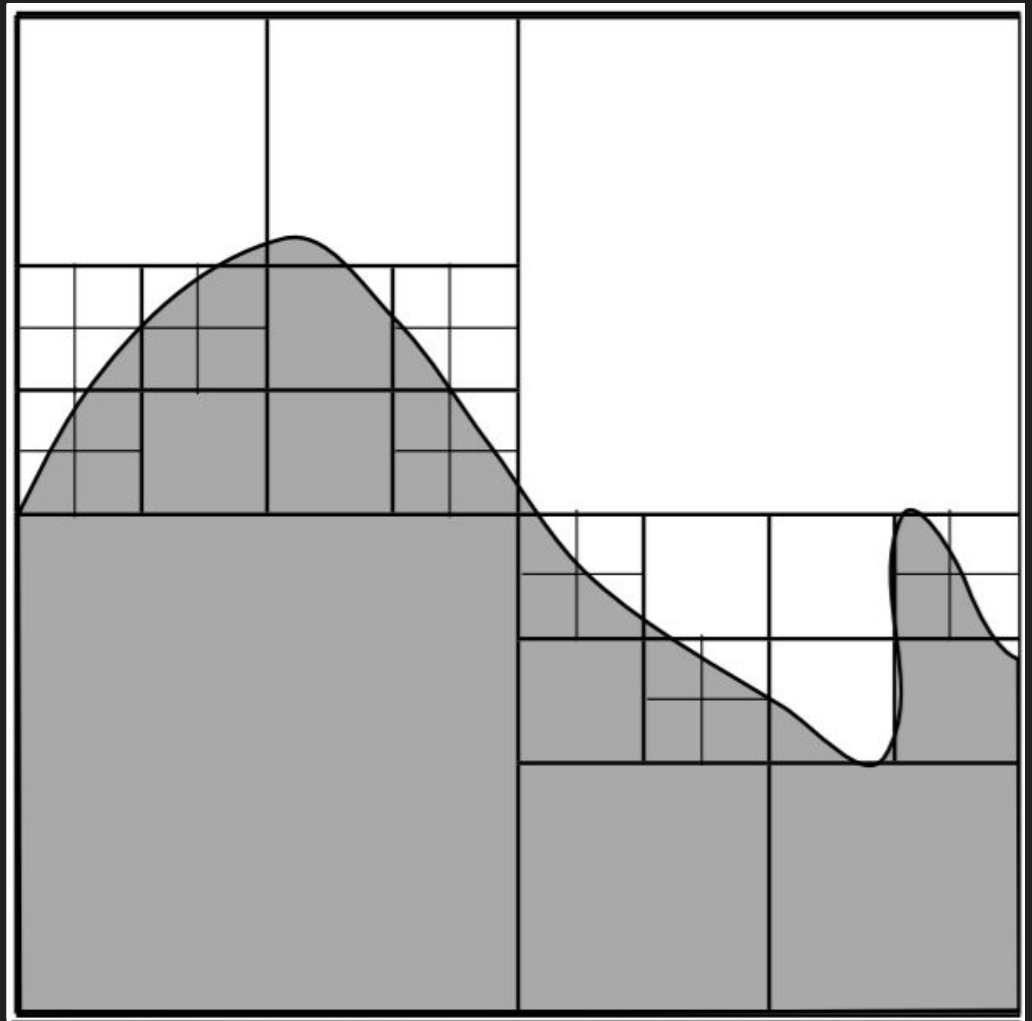
How does QuadTree Works?



Subdivide into uniform blocks

Merge Similar Brothers

Subdivide Non-homogenous Cells



How does QuadTree Works?

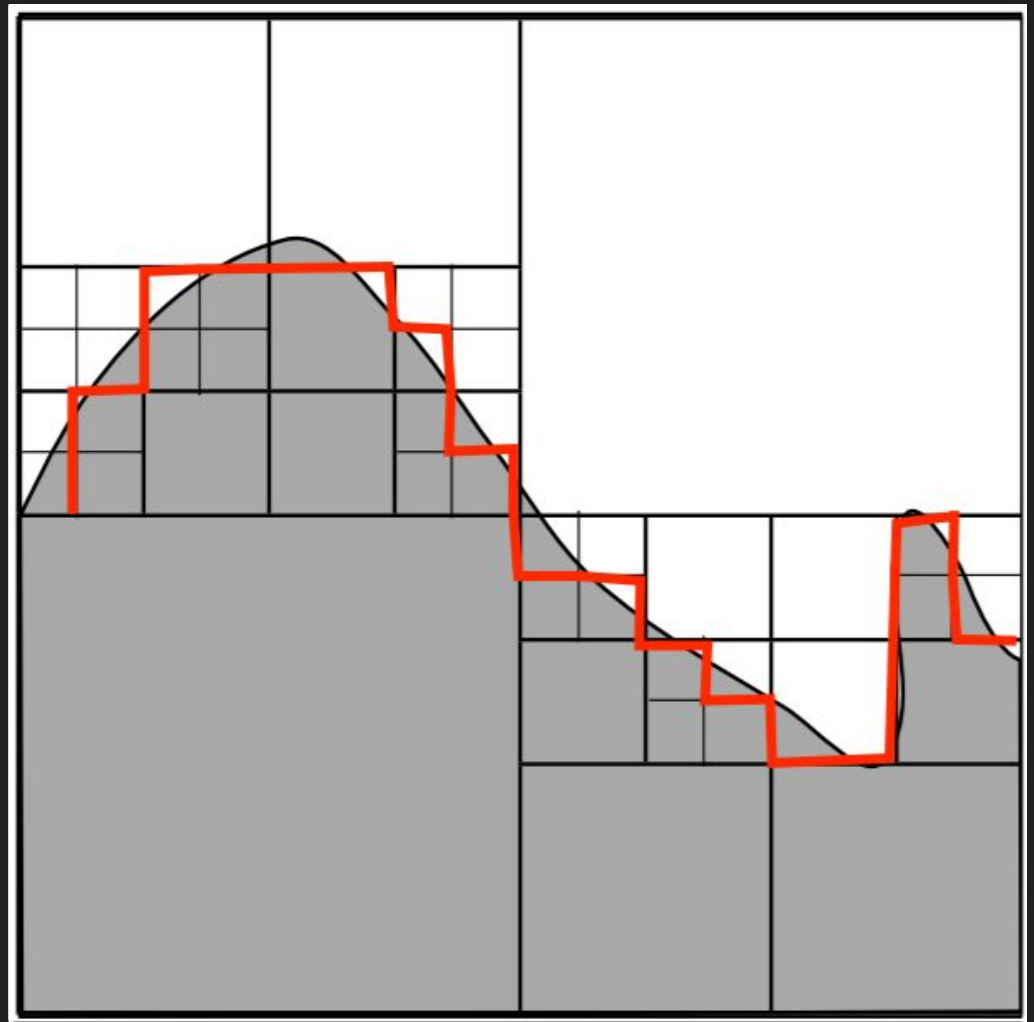


Subdivide into uniform blocks

Merge Similar Brothers

Subdivide Non-homogenous Cells

**Group Identical Blocks  
to get regions**

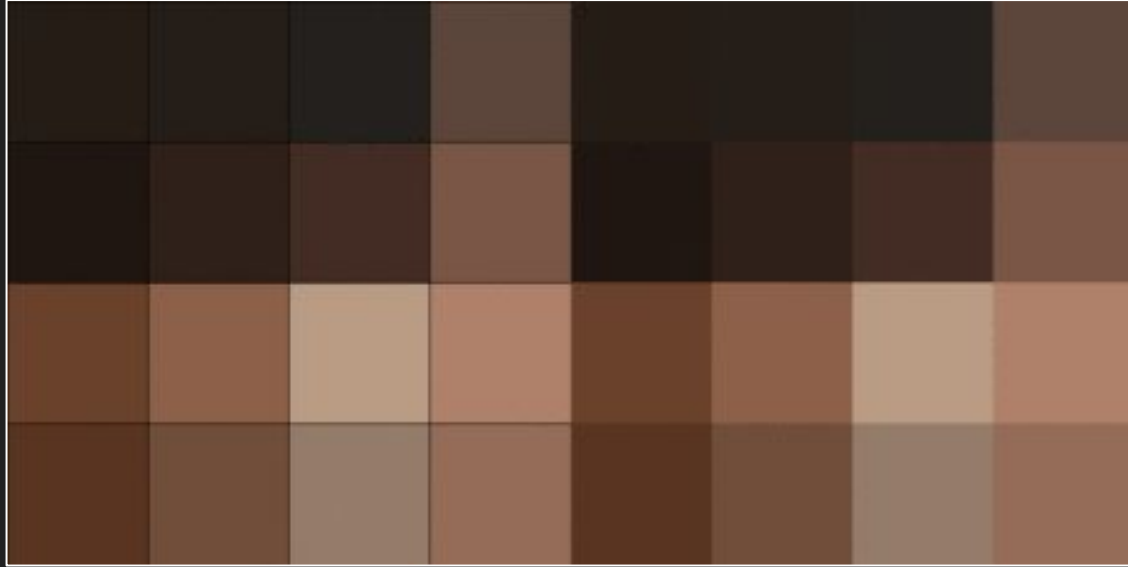






## QuadTree Compression of an image

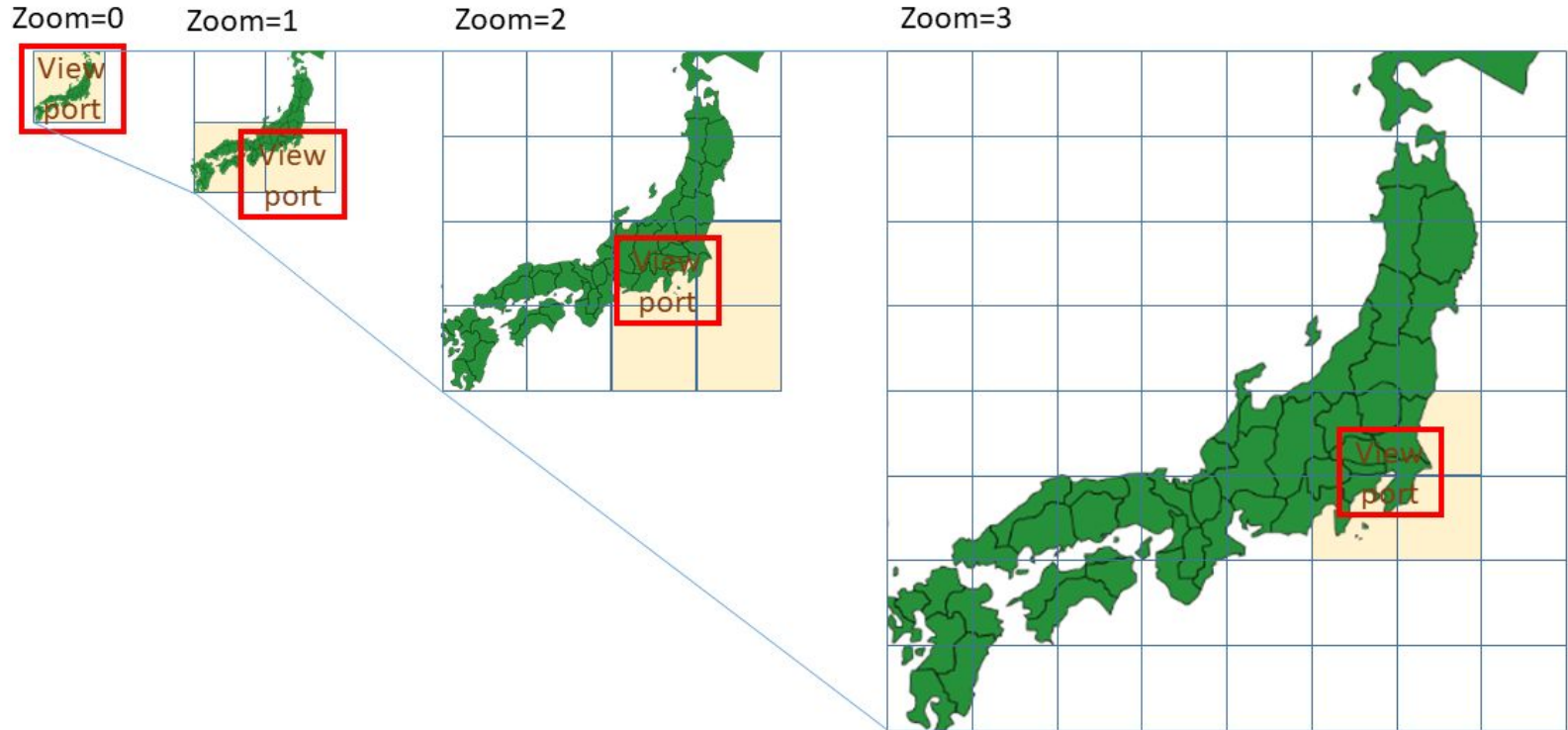
step by step



Left shows the compressed image with the tree bounding boxes  
while the right shows just the compressed image.

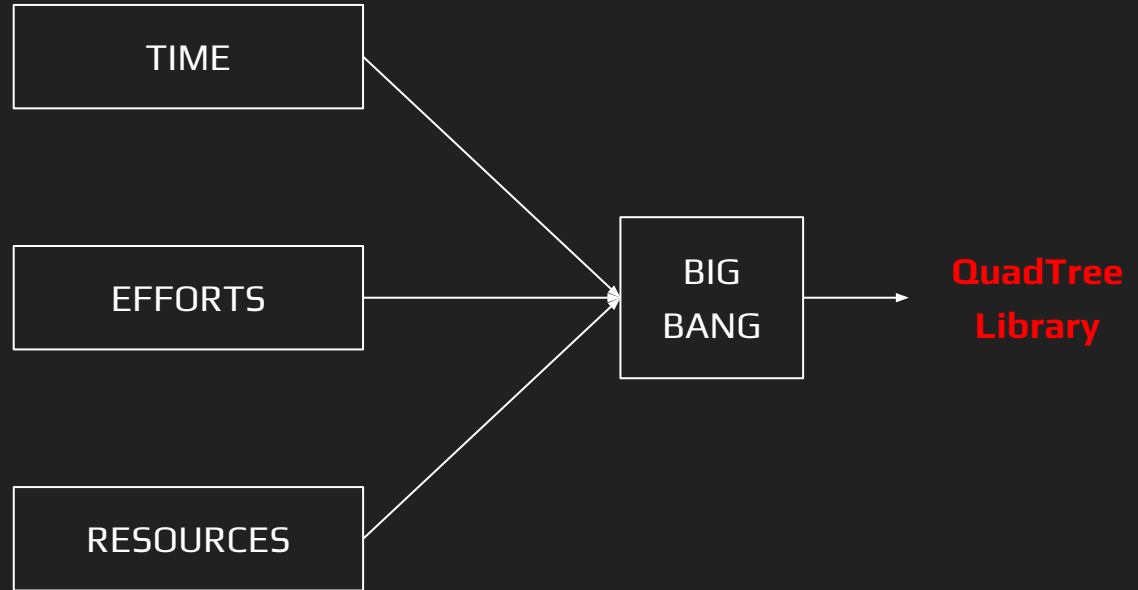
# Pyramid of tiles

- To be able to read efficiently according to zooming





# THE BIG BANG MODEL



# TOOLS AND TECHNOLOGIES USED

## TOOLS USED

- GitHub Pages
- CMake
- Visual Studio Code

## TECHNOLOGIES USED

- C/C++ Language

## PROJECT PLAN

#	Task	Start Date	End Date
1	Understand Object-Oriented Programming in C	17-09-2021	01-10-2021
2	Understand Design Patterns in C	01-10-2021	15-10-2021
3	Learn how to use TinyXml	15-10-2021	29-10-2021
4	Define ADT for QuadTree	29-10-2021	12-11-2021
5	Define the file format for QuadTree	12-11-2021	26-11-2021
6	Get your hands on the pcf_ui library	26-11-2021	10-12-2021
7	Understand the Drawing View Control of pcf_ui	10-12-2021	24-12-2021
8	Sequence diagram for your final application	24-12-2021	08-01-2022
9	Implement the Visualizer	08-01-2022	05-02-2022
10	Design the architecture of the application	05-02-2022	12-02-2022

## REFERENCES

- Q. Cai and Y. Zhou, "A quadtree-based hierarchical clustering method for visualizing large point dataset," 2016 Sixth International Conference on Information Science and Technology (ICIST), 2016, pp. 372-375, doi: 10.1109/ICIST.2016.7483441.
- "An effective way to represent quadtrees" Communications of the ACM, Volume 25, Issue 12, Dec 1982 pp 905–910, doi:10.1145/358728.358741
- "Optimal quadtree construction algorithms" Computer Vision, Graphics, and Image Processing, Volume 37, Issue 3, March 1987, pp 402–419, doi:10.1016/0734-189X(87)90045-4

**THANK YOU**