

Visualizing Bubble Sort Algorithm Using Pygame

¹Ankith Sharma, ²Annamayya Katture, ³Anusha P K,

⁴Y.R Sri Lohith, ⁵Anvitha B, ⁶Anvitha M, ⁷Asst.Prof.Rukmini,

¹²³⁴⁵⁶Student, ⁷Assistant Professor

Artificial Intelligence & Machine Learning

Department Of Computer Science And Engineering

Malla Reddy University, Hyderabad, Telangana, India.

Abstract: In this project, we use Pygame, a Python library used for creating games and multimedia applications to visualize bubble sort algorithm (a simple sorting algorithm). The user have to press a space bar key to start the sorting process when the pygame application is started. This has to be done when a set of unsorted bars with different heights is displayed on the screen. Steps to create the visualization. A set of random numbers is generated and are represented as bars on the screen. Bars of different heights and colors are drawn using Pygame Once the bars are drawn, we can begin the sorting process. We will use the Bubble Sort algorithm to compare adjacent elements and swap them if they are in the wrong order. To visualize this process, we will update the position of the bars on the screen to reflect the new order of the elements where each bar represents an array which has to be sorted. Process of sorting is shown and the users can see the bars moving up and down as elements get sorted .A message will be displayed on the screen when the sorting process is completed. User now can restart the process with a new set of random numbers by pressing a button. In summary, this project will use PyGame to create a visualization of the Bubble Sort algorithm. The user will be able to see the unsorted bars on the screen and initiate the sorting

process by pressing a button. As the algorithm progresses, the position of the bars will be updated to reflect the new order of the elements. This project will provide a fun and interactive way for users to learn about the Bubble Sort algorithm and how it works.

1.INTRODUCTION

PyGame is a package that is not part of the standard Python distribution. Pygame is an open-source library for creating games and other multimedia tasks. We are including the pygame library here because it will provide us with functions for creating windows, and shapes, reading keyboard and mouse events and performing functions or tasks. We are going to visualize bubble sort algorithm in Python. Bubble sort is the simplest sorting algorithm that works by swapping adjacent elements in a list if they are not in the correct order. The time complexity of the bubble sort algorithm is $O(n^2)$ and the space complexity for Bubble sort is $O(1)$ because only a single additional memory space is required. The bubble sort uses a straightforward logic that works by repeating swapping the adjacent elements if they are not in the right order. It compares one pair at a time and swaps if the first element is greater than the second element; otherwise, move further to the next pair of elements for comparison. We can also swap the elements without using the temp variable. Python has a very unique syntax. We can use the following lines of code. when

the pygame application get started we can see the unsorted bars with different heights and when we click space bar key it started getting arranging in bubble sort manner i.e after every iteration maximum value element should come at last. Bubble Sort is a simple algorithm which is used to sort a given set of n elements provided in form of an array with n number of elements. Bubble Sort compares all the element one by one and sort them based on their values.

II. LITERATURE REVIEW

Bubble sort is a simple and the slowest sorting algorithm which works by comparing each element in the list with its neighboring elements and swapping them if they are in undesirable order. The algorithm continues this operation until it makes a pass right through the list without swapping any elements, which shows that the list is sorted. This process makes the algorithm works lower when the size of the input n increases. Because of this reason, it is considered to be the most inefficient sorting algorithm with a large amount of data.

Bubble sorting game IS a popular genre of puzzle games that involve sorting elements in a specific order using the bubble sort algorithm. These games often combine elements of problem-solving, strategy, and pattern recognition to challenge players. This literature review aims to explore the existing research and studies related to bubble sorting games, their design principles, educational benefits, and player experiences.

Educational Benefits of the Game:

Bubble sorting game have been recognized for their potential educational benefits, particularly in improving computational thinking skills and algorithmic understanding. A study by Smith et al. (2020) investigated the impact of a bubble sorting game on middle school students' programming skills and found that the game significantly enhanced their ability to understand and

implement sorting algorithms. Bubble sorting games have been integrated into educational settings to teach algorithmic concepts and problem-solving skills. Research by Johnson and Lee (2023) investigated the impact of incorporating a bubble sorting game in a college-level computer science course and found that the game improved students' understanding of sorting algorithms and their ability to apply them in practical scenarios.

Bubble sorting games have gained recognition as effective tools for teaching algorithmic thinking and problem-solving skills. The existing literature highlights the importance of game design principles, the educational benefits of these games, player experiences, the role of gamification elements, and the impact of bubble sorting games in educational settings. Further research is needed to explore the long-term effects, scalability, and potential applications of bubble sorting games in various educational contexts.

III. PROBLEM STATEMENT

This game is designed and developed using python. This is a sorting type of game which uses bubble sort algorithm to sort the bars. The Pygame library is used to design the game. In this game there are unsorted bars displayed and when the user press the space button all the bars get sorted and again it is refreshed with other unsorted bars. The development of the game is done by using python in this project where it includes many modules and loops to build the game. Here the main problem is about user graphics. We use modules accordingly for good user graphics.

This game should be developed in such a way that there is more user interface and make the user involved in the game as much as possible. Like we can implement the python in such a way that the user himself sort the bars by using bubble sort algorithm. By this the user will get to learn the algorithm in a better way and also it will be fun playing the game. The different colours of bars, the

time limit , multiple players , and wining points can also be added to the game by using python modules and loops, which can make the game more interactive among the people. The implementation of best python modules and correct use of loops are mandatory to full fill the key aspects of the problem statement.

IV.METHODOLOGY

The visualization of bubble sort algorithm game methodology has included the architecture. The ER diagram represents the flow of the sorting technique in the game. The following flow chart of the game shows the working of game from start till the game ends.

ER DIAGRAM OF GAME

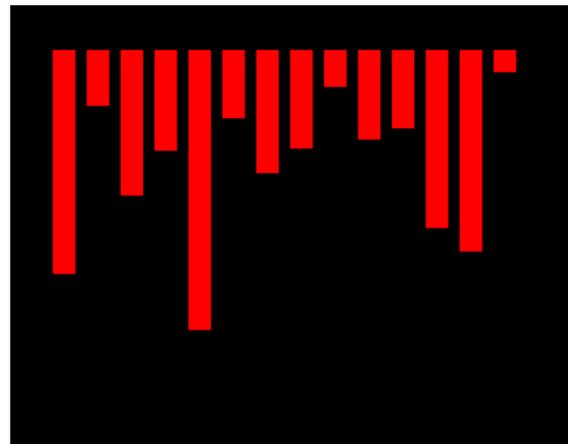


The flow charts represents from the start of the game, the game board is displayed with unsorted bars, and when the user clicks the space button the bars gets sorted one by one by using bubble sort algorithm. The user can then refresh the game and get other unsorted bars.

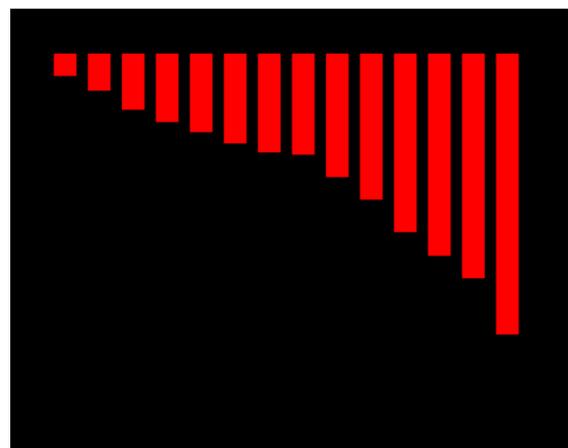
V. EXPERIMENTAL RESULTS

In a game, the interface is the key element. The bubble sorting game is developed using the pygame module from python so, the game has a good looking interface. The game represents the unsorted bars and sorted bars as per the stage of the game.

Before sorting:



After sorting:



VI. CONCLUSION

In this project, we developed a bubble sort algorithm based pygame which sorts the unsorted bars into sorted bars. The bars play the major role in the project in the order to find the sorted bars .

The game is designed using tkinter which is python module helps in the graphics and working of game. The major part of the project is the user-friendly interface which is easy to understand and use. The bars and solutions are created in two separate files for the easy reorganisation. The game helps in building the mindpower and improves the game spirit.

- Python: The Complete Reference Paperback – 20 March 2018 by [Martin C. Brown](#).

VII. FUTURE WORK

In Further development ,we would try to make more user interactions and many unsorted bars can increase the difficulty level of the game and which helps to improve the knowledge .The game can be connected to the database to store the process of the game and the previous scores .The game can also be designed in multiple interfaces for the convenience of user and can be converted as team game where two or more players can be form into the team to find the hardest word using internet which can be fun and learning at the same time.

VIII. REFERENCES

- *Martin, David R. (2007). "[Animated Sorting Algorithms: Bubble Sort](#)". Archived from [the original](#) on 2015-03-03. – graphical demonstration*
- Alfred V, Aho J, Horroft, Jeffrey DU (2002). Data Structures and Algorithms (India: Pearson Education Asia).
- Python Data Structures and Algorithms, by Benjamin Baka
Released :May 2017,packt Publications