Ahmedabad University

APPLIED LINEAR ALGEBRA

GAME THEORY USING COORDINATE SYSTEM IN JAVA

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Abstract

In today's world, games are played on computers, and some of the most attractive, engaging games are bouncing balls. In these, the ball/s is/are shot on the targets above. The target is to break as many balls as we can before they come down. So, for these real-life problems, we are going to use vector space and 2d geometry. For implementing the concepts of mathematics in coding, we are going to use python and their library.

- Extensive form
- Normal form
- Characteristic function form
- Alternative game representations

Introduction

Game theory is the study of mathematical models of strategic interaction among rational decision-makers. Game theory was developed in the 1950s there are many types of bifurcation of games such as:

1) Symmetric/Asymmetric
2) Cooperative /non-cooperative
3) Zero-sum/non-zero-sum
4) Simultaneous/sequential
5) Perfect information and imperfect information
6) Combinatorial games
7) Infinitely long games
8) Discrete and continuous games
9) Differential games representation of games can be done in

Background

As we know, playing games can be a great stress reliever. It also develops problem-solving skills and makes us more creative and imaginative. We will be making such a stress reliever game very well known as a bouncing ball. We will be using python and its inbuilt libraries to build the same. We will use concepts of linear algebra like vector space, coordinate systems, and 3D geometry.

We will use the coordinate system for locating the trajectory of the ball. We will treat the lower-left corner of the screen as the origin (0,0) of our coordinate system, with x increasing towards the right and y increasing as we move towards the top of the screen. So we can represent the ball's position by the coordinate pair(x,y).

Literature Survey

The project will employ unique technologies to build the mathematical model of the computer code that is also suitable in more advanced applications. In addition, the project in Java will be developed to reduce time consumption and make it more efficient and easier to read. Furthermore, packages awt,util,swing and graphics like will also be used in this project to build the GUI of the game.

Contibution

Prasham Mehta: Reproduced Work, Problem Statement.

Vatsal Barai: Graphical Editing, Action Plan, Motivation(work).

 Razin Karimi: Background, Problem Statement, Editing

Akshat Shah: Plan of Action, Title Slide, Literature Survey.

Yagnik Manav: Reproduced Work, References.

Mathematical Model

- We used Matrix system in our code to generate and arrange the bricks.
- We also used Coordinate system in our code
- First, we put the ball at a fixed position using coordinate system
- We have also used coordinate system in an if loop i.e., if the ball goes below a certain coordinate in the Y-axis, the game will get over.
- If coordinates of balls are nearly equal to coordinates of fixed brick then the brick will get deleted score of game will increase

Motivation

The main motive of the player(user) in this game is to hit the maximum number of balls. So the concept of "Best Possible Case" and "Worst Case" of hitting the balls in the programming is also applied. Players also have an option of collecting some of the checkpoints and power ups in the game (after a certain interval of time), which boosts the balls to hit hard and return slower. Players may collect such points and improve the amount of progress in the game. Players can collect the virtual coins as they play more and more games and it may give them some perks in clearing various levels of the game. Hence, it eventually makes the game interesting.

References

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